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PROGRESS OF THE BROOKLYN CONSOLIDATION.

During the coming two weeks the stockholders of the various companies in Brooklyn are to determine by special meetings, called for the purpose, whether they will accept the consolidation upon the terms submitted by the committee appointed by the various boards of directors to devise a scheme of amalgamation.

There is a very great difference of opinion expressed as to both the advisability and the probability of the adoption of the proposed scheme; those in favor of the scheme arguing that it will be a great boon to all concerned, while those opposed are equally positive that it will be simply "jumping out of the frying-pan into the fire," to consent to its fulfillment. In our correspondence, in another column, we publish the views of one opposed to it; and, while we are always gladly ready to present the views of all sides in any gas controversy, we feel bound to differ as to the views expressed about competition in the gas business. Strange as it may seem, it never has worked well; and we are bound to say that from evidence to be derived from all the competition that has been carried on in the gas business in this country and abroad, the results would seem to prove that one well-regulated gas company is enough for any place. The principle of amalgamation, *per se*, is a correct one. As to the details of the present scheme, it is for the stockholders to determine by their votes what they will do with their own property.

During last summer two large companies on the south side of the Thames in London amalgamated, and the result already has been cheaper gas to the consumers and as much profit to the shareholder as before. But in that amalgamation there were no wholesale issues of stock and bonds which represented nothing. The amalgamation was upon an honest business basis of the value of the works, property, etc., of the two companies. No watering-pot played a part in that scheme; and although we have never heard of any commissions being asked or paid for negotiating the adjustment, still they do one thing over there which should be imitated here, viz., when faithful and well-tried officers and servants of either company become supernumerary from the consolidation of two or more companies, they are retired and pensioned, receiving either an annuity, which amounts to a certain portion of their former salary, or a round sum calculated to be equivalent to such an annuity. And now the recent advices state that by New Year's the Phœnix Company will amalgamate also with the South Metropolitan Company in London, and that before long there will be still further consolidation which will make one grand company on the south of the Thames, and two on the north. It would be a blessing to the community if New York and Brooklyn had like prospects. It is said that the Peoples Company of Brooklyn will not go into the proposed scheme. How far this will affect the issue with the other companies remains to be seen. The two points of criticism upon the scheme, as published some time ago, are the amount of capital and the way it is to be distributed. As to the first point; $15 per thousand feet of gas sold per annum is an absurd amount of capital, simply from the fact that the same amount of business is being done to-day for $5 per thousand feet. The whole of Brooklyn's business is not as large as that of one of the companies in New York city. It may have a great future, but that will be hastened in its approach more by cheap gas than by large capital. As to the second point; that comes within the province of the "Great Divide," and it has, to an outsider, a little of the appearance of the well known settlement when the monkey was the arbitrator; but, nevertheless, it is perfectly competent for the stockholders to give away their stock to whomsoever they please. Whoever may be called upon to manage the new company will have plenty to do for a while to make gas and pay any large dividends.

COOKING BY GAS.

We would call especial attention to the papers read at Philadelphia which appear in this issue—more especially to the paper which shows the economy that may be obtained in the use of gas stoves over the ordinary cooking range. There has been heretofore a great deal of general, but yet indefinite, information published on this subject; but the facts and figures here given are the results of many practical tests, and it is the kind of information that should be possessed by every gas manager, and imparted freely and bountifully to every consumer. At the present season of the year it may not be expected to succeed in the general introduction of gas cooking stoves as well as during the warmer summer months, but a certain amount of educating of the public has to be done to secure the adoption by them of a new system of household economy. It may be slow work comparatively, but intelligent people desire a reason for what they do; they are the ones whose minds must be satisfied before the matter is adopted by them The circulation of information, correct and reasonable on its face, is the surest way to educate the public, and the long evenings of the winter season are the very times when people have the most opportunity for reading Every kind of correct and reliable information that can be given to the consumers concerning the proper use of gas, must tend to increase the demand for it, and that is what every company needs, and should seek by every proper means to secure. In order to meet the demand for such useful information, we have printed a large number of small and convenient pamphlets, which contain the facts and figures set forth in the paper on the economy of cooking by gas, for the express purpose of placing this information in such form that the gas companies throughout the country can distribute it to their consumers. This was done at the suggestion of several members of the Association at Philadelphia, and a large number of copies were then ordered. Those companies who have not already done so will oblige us by sending us their orders as early as possible, and then when the spring comes they will be in a position to push the introduction of gas stoves vigorously, and secure an ample return from the increased consumption.

[From the St. Louis *Globe-Democrat.*]

The City of St. Louis vs. The St Louis Gas Light Company.—Text of the Supreme Court Opinion in Full.

(Continued from page 242.)

The petition further states that plaintiff and defendant, on January 9, 1846, made a

CONTRACT IN WRITING,

in the fifth clause of which the plaintiff relinquished the right to purchase the gas works, etc., at the end of the twenty years from January 1, 1840, as provided in the twenty-seventh section of said charter, as said: provided that in case the plaintiff declined to purchase the gas works at the end of 25 years from January 1, 1840, as provided for in the incorporating acts, the plaintiff should have the privilege of purchasing at the end of 30 years from January 1, 1840, and at the period of every five years thereafter, in the manner as provided in the charter. The petition further avers that the City of St. Louis, by its city council, did, on February 26, 1869, adopt a resolution resolving that it would purchase the gas works, and requesting the Mayor of the city to notify the president and directors of said defendant of the intention of the city to purchase the same at the time prescribed by law, to-wit: on January 1, 1870, and that on February 27, the president and directors of the gas company were duly notified of the adoption of the resolution; that thereafter, on November 26, 1869, the city of St. Louis appointed three arbitrators, qualified as provided by the charter, to act in conjunction with the same number to be chosen by the defendant in fixing the price and value of the gas works, etc., as specified in the charter, and in the contract of January 9, 1846, of which the defendant was duly notified on December 1, 1869; that the arbitrators chosen by the city appeared at the time and place appointed on December 4, but that defendant failed and refused to appoint arbitrators, and denied the validity of the clause in the contract which provides for the purchase on or after January 1, 1870.

The petition also avers that defendant ought not to be heard in averring that the contract of 1846 was invalid, because the clause authorizing the purchase on January 1, 1870, was inserted therein, at the instance of defendant, for the fraudulent purpose of inducing the plaintiff to forego said purchase, at either of the times mentioned in the charter, on the belief that it had the right to purchase, and defendant would sell, on January 1, 1870, or any period of five years thereafter, as provided in said contract; that plaintiff, on the faith of said contract, did

FOREGO THE RIGHT

to make the said purchase at either of the times mentioned in the charter of the defendant; that under a contract made between plaintiff and defendant on January 8, 1841, penalties had accrued which defendant owed plaintiff, amounting in the aggregate to $100,000, all of which were released and discharged by the contract of 1846, and that it would be against equity to permit plaintiff to arrest the invalidity thereof.

It further alleges the incorporation of the Laclede Gas Light Company, and that it was authorized by various acts of the Legislature to vend gas within the corporate limits of the city, and to establish and lay pipes, mains, etc., necessary for that purpose; that a controversy arose between the two gas companies as to the right of the Laclede Gas Light Company to exercise the above privileges, the St. Louis Gas Light Company disputing such right, and claiming that the exclusive right of making and vending gas belonged to it; that this controversy was in 1872 compromised, under the terms of which the Laclede Gas Light Company undertook to purchase the pipes, mains, etc., of the St. Louis Gas Light Company north of a line coincident with the south line of Washington avenue, and then the St. Louis Gas Light Company abandoned its exclusive right to manufacture gas in that part of the city, and the manufacture and sale of gas therein was undertaken by the said Laclede Gas Light Company. It is then alleged that the said company, for the purpose of effecting and carrying out said compromise, caused an ordinance to be prepared and submitted, on the 10th of February, 1873, to the city council of St. Louis, which on that day was adopted, and is entitled an ordinance to provide for the better lighting of St. Louis with gas, for the reduction in the price of gas, for the settlement of litigation between the city and the St. Louis Gas Light Company, to provide for the establishment of another gas light company in the city of St. Louis, and for controlling the quality and standard of gas and gas lights for the city, and to repeal article five, of chapter thirteen, of the revised ordinances of 1871.

THE TRIPARTITE AGREEMENT.

It is then alleged that on February 28, 1873, the precise terms and language of the ordinance were embodied in a contract of three parts, which was sealed, executed and delivered by and between the city of St. Louis of the first part, the Laclede Gas Light Company of the second part, and the St. Louis Gas Light Company of the third part. The ordinance and contract are fully set forth in the petitions, but we will only insert here such provisions as we deem to have a material bearing on the questions involved.

The first section of the ordinance prescribes that the St. Louis Gas Light company waives, abandons and surrenders forever to the city of St. Louis irrevocably any and all claim, and pretense of claim, of exclusive right to have gas works, lay or have pipes or other appliances, vend or furnish gas, or do business as a gas company in said city north of Washington avenue, and the St. Louis Gas Company covenants and agrees with the said city and the Laclede Gas Light Company that it will not, within said district or portion of the city, at any time assert any claim or right to hinder or prevent the erection or completion of any gas works or the laying down of mains, pipes or other things, or furnishing or supplying, as to the city and its inhabitants, by any gas company; nor any act or thing to be done by the St. Louis Gas Light Company to hinder or molest the Laclede Gas Company, or any other gas company or private individuals, in erecting, having or using the works, pipes and appliances for carrying on the business of a gas light company, and furnishing gas lights in the aforesaid portion or district of said city, so that both of said gas companies, and any other gas company or private individual, shall be permitted to exist and do business in the aforesaid district, or portion of said city, without hindrance.

2. The Laclede Gas Light Company and the St. Louis Gas Light Company, each and both of them, further covenant and agree with the city of St. Louis that each one of the said companies shall act only under its own charter and franchises; that each shall have its own property and manager and prosecute its own separate business under its own charter and franchises, but the Laclede Gas Light Company abandons and surrenders fully and completely any and all exclusive right of lighting any part of the city of St. Louis with gas or making or vending gas, gas lights, or gas fixtures, and all sole or exclusive right whatsoever claimed under its charter, or by the aforesaid surrender, to it or otherwise; such surrenders and abandonments by both companies to be done and effected in a legal and binding manner. It being hereby understood and agreed that the district and portion of said city which is to be occupied by the Laclede Gas Light Company, and for and within which it herein contracted for by it is, and shall be, the district aforesaid all north of said line above described; and that the district and portion of said city which is to be occupied by the St. Louis Gas Light Company and for and within which it herein contracts to furnish gas and to do all other things herein contracted for by it, and shall be the remainder or balance of said city, so far as the charter of the St. Louis Gas Light Company extends and authorises.

The third clause provides for the appointment of a gas light inspector, the payment of his salary by the two companies, and prescribes the duties to be performed by him.

The fourth provides for the quality of the gas to be furnished and the method of testing it, and that the price of gas furnished shall not exceed $3.25 per 1,000 cubic feet, and that it shall be further reduced as coal may be reduced in price. It also contains the following:

Each of said gas companies further agrees that the city may require the laying and placing of additional mains, with all necessary and proper connections, in each year to an amount and extent by each company of two and a-half miles of mains, being, in all, five miles in each year, to which amount and extent each of said gas companies respectively shall be bound to furnish, and lay the same, if required. And in case the city shall not in any one year require the laying and placing of such mains or pipes as aforesaid, then it may require the laying and placing of such mains and pipe to an extent not to exceed an average of five miles per year; being an average of two and a-half miles per year during this contract with each gas company. And the city shall have the right to

ORDER THE ERECTION

of any and all lamps it may desire at all places where the mains are laid, or as fast as they shall be thereafter laid; but no charge is to be made against said city, nor is any payment to be made by it, for or on account of any mains pipes, lamps, lamp posts or other erections made by either of said gas companies—said city only to pay for the gas used by it on the terms herein stated, anything in the charter of either of said gas companies to the contrary notwithstanding.

The fifth and sixth clauses relate to supplying and keeping in repair lamps, lamp posts, burners, etc., and to the payment for gas furnished public lamps.

[To be continued.]

CHANGE IN THE MANAGEMENT AT ROCHESTER.—At a recent meeting of the board of directors of the Rochester Gas Light Company an important change was made in the management, by which a well known and competent engineer and superintendent was promoted to fill at once three responsible positions. Matt Cartwright was elected secretary, treasurer, and superintendent of the company.

Mr. Cartwright is well known to our citizens. He was the engineer of the Citizens gas company of this city at its organization and some time afterward. Now he has been elected as above stated, and once more resumes his place in our midst.—*Rochester Democrat.*

Proceedings of the Seventh Annual Meeting of the American Gas Light Association.

HELD AT PHILADELPHIA, PA., OCTOBER 16, 1879.

[Continued from page 251.]

SECOND DAY—OCTOBER 16, 1879.

Mr. Neal—It seems to me that the discussion of this paper has been prolonged to a considerable extent, and, as the subject seems to be pretty nearly exhausted, I move that the thanks of the Association be tendered to Mr. Pearson for his valuable paper, and also for the kind and courteous manner in which he has responded to the many questions that have been asked him.

The President—I disclaim any intention of impeaching, in the slightest degree, the value of Mr. Pearson's article. I thought perhaps he went a little out of his way to tell what had been done in other places in respect to the Lowe process, when it was a well-known fact that it had not been in use in some of those places—especially in Utica—for a long time. I think we all expected that Mr. Pearson would give us a statement of his personal experience.

Mr. Pearson—I did not know whether all the members understood how the process worked, and I did not think it was unbecoming in me to give a brief history of the introduction and operation of the process in other places; and I did so in introducing my paper; and, with all due deference to the Chair, I think it was a very proper introduction.

Mr. Harbison—I heartily agree with Mr. Pearson upon that point, and I hope he will not stop the investigation here. His paper has been very interesting and instructive. His experience has not been sufficient for him to satisfactorily answer many inquiries, but he has given us all the information he has at his command, derived from his experience and observation during the few months the process has been in operation at his works. His statistics are very satisfactory and clear so far as they go, and reflect a great deal of credit upon him. I think the thanks of the Association are certainly due him—not only for the information he has given us in his paper, but also for the frank and courteous manner in which he has answered our inquiries. I trust that he will continue to gather statistics from the practical working of the process during the current year, and that when we meet again he will be able to give us further information. He will then have passed through a year's experience, and some questions which he could not answer to-day he will then be able to answer; and I have no doubt he will cheerfully do so. I therefore move, Mr. President, that he be invited to continue his investigations and report the result at our next annual meeting.

Mr. Neal—I accept that as an amendment to my motion.

The President—The motion is, that a vote of thanks be tendered Mr. Pearson for his valuable paper, and for the courteous manner in which he has answered the questions propounded to him; and also that he be requested to continue his observations and report at the next annual meeting.

Carried.

Mr. Neal—There is a paper that has been handed to the Executive Committee for their approval, written by Mr. Farmer, on the Dieterich furnace.

Mr. Allen—I understood that an opportunity was to be offered to members to discuss the subject of water gas generally. I did not understand the discussion to be confined to the Lowe process, but to be upon water gas as compared with coal gas. I think Mr. Pearson has not been able to examine the subject long enough to give us definite information, and it seems to me the subject should be further discussed.

The President—I will state to the gentleman that in the reply I made to his question some time since, I did not mean to commit the Association to any particular order of business. The order we adopted this morning was to listen to the reading of the papers, and then to discuss the questions that might be raised by them. In pursuance of that order we heard the paper of Mr. Pearson read, and the members of the Association have been asking and he has been answering questions. The discussion upon that paper is now closed. Other papers are to be read, and our time is short. Unless the Association decree it by vote, it will not be proper to depart from the regular order of business; but if, after all the papers have been read and the discussion upon them closed, there is sufficient time remaining, you will have an opportunity to be heard, if the Association should so direct.

Mr. Allen—It seems to me to be hardly fair that the discussion of so great a question should be confined to one paper.

The President—Have you a paper?

Mr. Allen—I did not prepare any paper. I supposed that after all these questions had been asked and the subject presented, it would be legitimate for me to speak upon it.

The President—The special subject under consideration was the Lowe process as used at Toronto, and not the water gas question. Now, we have disposed of that question, and unless the Association direct, I do not propose to depart from the regular order of business.

Mr. McIlhenny—I hope, if any time can be spared, that Mr. Allen will be heard. So far as I am concerned, I have no desire to shut off discussion on any subject; and if Mr. Allen has anything to say that will be of interest, I hope he will have an opportunity of saying it.

Mr. Allen—A great deal of time was spent in asking questions upon a matter that was merely local.

The Secretary—If Mr. Allen will listen to me for a moment, knowing as I do the condition of the business before the Association, I think he will be satisfied that the regular order should be adhered to, and that the discussion of the water gas question should come at a later period.

Mr. Allen—I am perfectly willing to abide by the wishes of the Association.

The President—We have considerable business before us that has been approved by the Executive Committee. Of course, it is for the Association to decide whether they will go on with the regular order of business or take up the water gas question.

Mr. Neal—I move that the regular order of business be adhered to.

Carried.

The President—The next thing in order is the paper by Mr. Farmer, which will be read by Major Dresser.

Major Dresser—Mr. Farmer has requested me to read this paper for him in his absence. I suppose you are all aware of the general features of the Dieterich furnace. In a few words, it is simply placing the furnace beneath the bench and in front of it, and hauling the hot coke from a portion of the retorts into this furnace, and then the products of combustion are carried up into the same chamber or oven as in the ordinary setting. It amounts practically to enlarging the furnace itself by deepening and broadening it in front of the bench.

Major Dresser then read the paper of Mr. Farmer as follows:

THE DIETERICH FURNACE.

To make a long story as short as possible, we will begin at once with the claims made by Mr. Charles F. Dieterich, and then wind up with some comparisons and results.

1. That 2½ per cent. of Cannelton cannel in the mixture will give by this process the same yield and candle power as 5 per cent. of the same will give by the ordinary process; and that this increase is brought out by the high and constant temperature which is maintained in every part of the oven, and especially at that part next the mouth-piece. It thus at all times converts the tarry oil into a rich and fixed gas, instead of into a vapor, which is generally generated at the front of the bench for a certain time after the charge of coal is put in."

To make this claim a little clearer, we will convert it into a more simple form—

When 2½ per cent. of the Cannelton cannel is used in the mixture and burnt off in the ordinary bench, we generally obtain about the following results:

2½ per cent. of Cannelton × 252 candle feet	630
97½ per cent. of Penn × 70 candle feet	6,825
100	7,455

And one pound of the mixture will yield 74.55 candle feet.

When 5 per cent. of the Cannelton cannel is used in the mixture and burnt of in the ordinary bench, we generally obtain about the following results:

5 per cent. of Cannelton × 252 candle feet	1,260
95 per cent. of Penn × 70 candle feet	6,650
100	7,910

And one pound of the mixture will yield 79.10 candle feet. Hence, $\frac{(79.10-74.55)\times 100}{74.55} = 6.10$ per cent., is the actual gain in the yield and candle power together.

Accordingly, if we put 2½ per cent. of the Cannelton cannel in the mixture for each bench or process, then the yield per pound from the Dieterich bench will be about 6.10 per cent. greater than that obtained from the ordinary bench.

Therefore the coefficient for the Penn coal when carbonized in the ordinary benches will be abort 70 candle feet; and when carbonized in the Dieterich benches will be about $70+\frac{70\times 6.10}{100} = 74.27$ candle feet per pound. Accordingly the coefficient of the Cannelton cannel, when carbonized in the ordinary benches, will be about 252 candle feet, and when carbon-

ized in the Dieterich bench will be about $252+\frac{252\times 6.10}{100}=267.37$ candle feet per pound.

2. "That the Dieterich bench will burn off 225-pound charges in three hours, or 10,800 pounds of coal in the 24 hours, just as readily as the ordinary bench will burn off 200-pound charges in four hours, or 7,200 pounds of coal in the 24 hours." Accordingly the Dieterich bench will burn off 50 per cent. more coal in the 24 hours than that generally burnt off in the ordinary bench in the same time.

3. "That one of these benches can be run during the 24 hours, with only 1.66 men, in the place of 2 men, which are generally required to run the ordinary bench for the same time. And also that one man can attend to from 16 to 20 of the fires."

Consequently this will reduce the labor account just 17 per cent.

4. "That 25 per cent. of the coke which is made will burn off the 225 pound charges in the Dieterich bench just a easily as 40 per cent. of the same will burn off the 200 pound charges in the ordinary bench."

Accordingly this reduces the fuel required for the bench 37½ per cent. below that required for the ordinary bench.

We will now compare the work done by one of these benches with that done by one of the ordinary benches, and for this purpose we will take two benches of sixes, in which the retorts are each 12″x20″x8′ 6″ long.

The following items will give the coals used, the products, and the imaginary prices:

Penn coal, at $5.50 per gross ton delivered in the yard, yields about—
70 candle feet per pound by the ordinary process.
38 bushels of coke per ton, worth 4 cents per bushel.
10 gallons of tar per ton, worth 2 cents. per gallon.
20 gallons of liquor per ton, worth ½ cent per gallon.

97½ per cent. of this will be required in the mixture to yield 79.10 candle feet per pound by the Dieterich process, and 95 per cent. will be required in the mixture to yield the same by the ordinary process.

Cannelton cannel, at $10 per gross ton delivered in the yard, yields about—
252 candle feet per pound by the ordinary process.
32 bushels of coke per ton, worth 3 cents per bushel.
10 gallons of tar per ton, worth 2 cents per gallon.
20 gallons of liquor per ton, worth ½ cent. per gallon.

2½ per cent. of this cannel will be required in the mixture to yield 79.10 candle feet per pound by the Dieterich process, and 5 per cent. will be required in the mixture to yield the same by the ordinary process.

Cost of the Gas when made by the Ordinary Process.

Retorts, 12″ × 20″ × 8′ 6″ long. One of these benches will burn off about 7200 pounds, or 3.214 tons, of a mixture compounded of 95 per cent. of Penn coal and 5 per cent. of Cannelton cannel in the 24 hours, which will yield 79.10 candle feet, or 4.943 cubic feet, of 16-candle gas per pound.

Accordingly we shall have 6840 pounds, or 3.054 tons, of the Penn coal and 360 pounds, or 0.160 tons, of the Cannelton cannel in the mixture; and the cost of the gas will be as follaws:

Debtor.

3.054 tons of Penn coal, at $5.50	$16.79
0.160 tons of Cannelton cannel, at $10	1.60
2 men, at $2.50 per day each	5.00
50 bushels of coke, at 4 cents per bushel	2.00
Wear and tear of bench at 78 cents	.78
Total cost of labor and materials	$26.17

Creditor.

116 bushels of Penn coke, at 4 cents	$4.64	
5 bushels of Cannelton coke, at 3 cents	.15	
32 gallons of tar, at 2 cents	.64	
64 gallons of liquor, at ½ cent	.32	
		$5.75
Total cost of gas make from 7200 pounds of mixture.		$20.42

6840 pounds of Penn × 70 candle feet. .... 478,800 candle feet.
360 pounds of Cannelton × 252 ..... 90,720 "
7200 pounds of the mixture yields ..... 569,520 candle feet.

Hence, 1 pound of the mixture will yield $\frac{569,520}{7200}=79.10$ candle feet; and 1000 candle feet will cost $\frac{20.42\times 1000}{569,520}=3.585$ cents. Or, 1000 cubic feet of 16 candle gas will cost $3,585\times 16=57.36$ cents.

Cost of the Gas when made by the Dieterich Process

Retorts, 12″ × 20″ × 8′ 6″ long. One of these benches will burn off about 10,800 pounds, or 4.820 tons, of mixture compounded of 97½ per cent. of Penn coal and 2½ per cent. Cannelton cannel, in the 24 hours, which will yield 79.10 candle feet per pound, or 4.943 cubic feet of 16-candle gas.

Accordingly we shalt have 10,530 pounds, or 4.70 tons, of the Penn coal and 270 pounds, or 0.12 ton, of the Cannelton cannel in the mixture; and the cost of the gas will be as follows:

Debtor.

4.70 tons of Penn coal, at $5.50	$25.85
0.12 tons of Cannelton cannel, at $10	1.20
45.79 bushels of coke, at 4 cents	1.83
1.66 men, at $2.50 per day each	4.15
Wear and tear of bench, at $1.07	1.07
Total cost of labor and materials	$34.10

Creditor.

178 bushels of Penn coke, at 4 cents	$7.12	
4 bushels of Cannelton, at 3 cents	.12	
48 gallons of tar, at 2 cents	.96	
96 gallons of liquor, at ½ cent	.48	
		$8.68
Total cost of gas made from 10,800 pounds of mixture,		$25.42

10,530 pounds of Penn × 74.27 candle feet .... 782,063.10 candle feet.
270 pounds of Cannelton × 276.37 ..... 72,189.90 "
10,800 pounds of the mixture yields ..... 854,253.00 gandle feet.

Hence, 1 pound of the mixture will yield $\frac{854,253}{10,800}=79.10$ candle feet; and 1000 candle feet willl cost $\frac{25.42\times 1000}{854,253}=2.975$ cents. Or, 1000 cubic feet of 16-candle gas will cost $2.975\times 16=47.60$ cents.

Recapitulation.

The Dieterich bench produced	854,253 candle feet.
Ordinary bench produced	569,520 "
Difference per day	284,733 candle feet.

Accordingly the yield obtained from the Dieterich bench was $\frac{284,733\times 100}{569,520}$ =50 per cent. more than that obtained from the ordinary bench.

Or, in other words, one of the Dieterich benches is equivalent to one and a half benches of the ordinary construction.

The Dieterich bench will make $\frac{854,253}{16}=53,391$ cubic feet of 16-candle gas in the 24 hours, which will cost 47.60 cents per 1000 cubic feet when the prices for materials and labor are as before mentioned.

The ordinary bench will make $\frac{569,520}{16}=35,595$ cubic feet of 16-candle gas in the 24 hours, which will cost 57.36 cents per 1000 cubic feet.

53,391	cubic feet of 16-candle gas, at	57.36	cents per 1000..	$30 62
53,391	" "	47.60	" 1000..	25 41
Extra cost of gas made by the ordinary bench.				$5 21

Accordingly the Dieterich bench saves per day $5.21; per year, $1,901.65

Dieterich Process.

Cost of material and labor per 1000 cubic feet of gas:

Coal per 1000 cubic feet, $\frac{27.05\times 1000}{53,391}=50.66$ cents.

Coal, minus value of residuals, $\frac{(27.05-8.68)\times 1000}{53,391}=34.40$ cents.

Labor per 1000 cubic feet, $\frac{4.15\times 1000}{53,391}=$ ..... 7.78 cents.

Fuel per 1000 cubic feet, $\frac{1.83\times 1000}{53,391}=$ ..... 3.42 cents.

Wear and tear per 1000 cubic feet, $\frac{1.07\times 1000}{53,391}=$ ..... 2.00 cents.

Total cost of the gas per 1000 cubic feet ..... 47.60 cents.
Yield per bench of sixes in the 24 hours ..... 53,391.0 cubic feet.
Yield per retort, 20″ × 12″ × 8′ 6″ long ..... 8,898.5 cubic feet.

As the price of the coal in New York is now 18 per cent. lower than the

imaginary prices used in the preceding calculations, the cost of the coal and gas will be as follows, if we allow for that reduction:

Coal per 1000 cubic feet	41.55 cents.
Coal, minus value of residuals	28.21 "
Gas per 1000 cubic feet	41.41 "

Ordinary Process.

Coal per 1000 cubic feet, $\frac{18.39 \times 1000}{35{,}595} = 51.66$ cents.

Coal, minus value of residuals, $\frac{(18.39-5.75) \times 1000}{35{,}595} = 35.51$ cents.

Labor per 1000 cubic feet, $\frac{5.00 \times 1000}{35{,}595} =$ ..... 14.04 cents.

Fuel per 1000 cubic feet, $\frac{2.00 \times 1000}{35{,}595} =$ ..... 5.62 cents.

Wear and tear per 1000 cubic feet, $\frac{0.78 \times 1000}{35{,}595} =$ ..... 2.19 cents.

Total cost of the gas per 1000 cubic feet ..... 57.36 cents.

Yield per bench of sixes in the 24 hours ..... 35,595.00 cubic feet.
Yield per retort, $20'' \times 12'' \times 8'\ 6''$ ..... 5,932.50 cubic feet.

And when we take off the 18 per cent. reduction for coal as before mentioned, the cost of the coal and gas will be as follows:

Coal per 1000 cubic feet of gas	42.37 cents.
Coal, minus value of residuals	29.12 cents.
And the gas therefrom per 1000	50.97 cents.

Our figures give the cost of the gas at the exit of the retort house when the benches are in perfect order; consequently an allowance must be made in practice for imperfect benches and scurfing. But this allowance will not affect the general ratio existing between the two systems.

By substituting other figures for those used in the preceding formulas for the cost of coal, labor, coke, etc., results may be obtained which will accord with the same in any locality.

The average yield from the Dieterich benches for the month of August last was 51,042 cubic feet of gas per bench, or 8,507 cubic feet per retort; and included the retorts which were missing and scurfing.

The average yield per pound of coal was 5.07 cubic feet of 17,83 candle gas, and the tests were made on the standard 15-hole Argand burner.

The maximum yield per retort during the time before mentioned was 9125 cubic feet.

On motion of Mr Neal, the Association passed a vote of thanks to Mr. Farmer for his paper, and then took a recess until 3 P. M.

Afternoon Session.

Convention called to order at 3 P. M.

The President—It seems desirable to appoint a Committee of Arrangements for the meeting to be held next year at Chicago, and this seems to be a very good time to attend to that matter.

Mr. Neal—I move that a committee of three be appointed to make arrangements for the meeting to be held next year at Chicago.

Carried.

The President—It was arranged at this point in our proceedings to have a lecture by Mr. Page upon "Coal Tar Distillation;" but as he is out for a moment, we will have a paper read, written by Mr. Cathels, upon "Retort Settings."

Mr. Neal—After the paper is read I desire to make a report from the Finance Committee. A majority of the Finance Committee have requested me to propose the name of Mr. Benjamin F. Archer, director of the Camden Gas Light Company, of New Jersey, as a member of this Association. His application is indorsed by Mr. Goodwin and myself. I move that the usual course be taken.

Carried.

The Secretary was authorized to cast a ballot on behalf of the Association for the election of Mr. Archer to active membership.

Major Dresser was appointed teller, and declared Mr. Archer to be unanimously elected an active member of the Association.

Mr. Neal—Prof. Love is present, and has a paper prepared upon "Standard Burners." This paper was approved by a majority of the Executive Committee.

The President—It will come immediately after the reading of Mr. Cathels' paper.

Major Dresser then read the paper by Mr. Cathels on "Retort Settings," as follows:

A Few Supplementary Words on Retort Settings, Especially with Reference to Small Gas Works.

At the risk of being regarded by some as having retorts on the brain, I venture to recur to the important question in the economy of coal gas works of the methods of setting the retorts, in a few supplementary words, in introducing to the meeting some working drawings of settings suitable for small works.

The smallest gas works can be carried on relatively as succefully in their way as the largest, but then the ways are as different as the ways of those who, being restricted to limited means, have to contrive by wisely moderated desires and the exercise of a careful and judicious expenditure to make ends meet, and their richer neighbors, who can enjoy the goods the gods send in a luxurious way denied to others whose lines have not fallen in such pleasant places. Much that is considered nowise extravagant in the more liberal and ornamental equipment, and in the manner of conducting the business of large gas companies, has to be rigidly eschewed in small works. Especially has outlay on appearances to be denied. Utility must be the chief, if not sole consideration, if the undertaking is to be made to pay. But, on the other hand, niggardliness should not be carried so far as to starve the concern. It is mistaken economy not to allow the workman good tools. The farmer who impoverishes his land will reap but poor crops; nor will a gas company, especially with makeshift retort settings, be likely to prosper.

A fried of the writer in England—a gas engineer of large practice—once gave him as his reason for becoming connected with the gas works of a very small town, his desire to learn how such works were managed; and it having been the writer's lot during the last year or two to serve a similar apprenticeship, the necessity presented itself of providing suitable settings, and it has been suggested that the production here of the drawings of some of them might perhaps be acceptable.

That part of the plant of small works he has often found to be faulty, either in the retorts not heating properly, or in too large a consumption of fuel; and generally in the retorts not wearing well. As an instance, he had occasion two years ago to make a valuation of small works, and subsequently to carry them on. There were two beds of three clays each, which appeared in fairly good condition, one of them not having been long set; but they were found to require as much fuel as should suffice for good settings of six or seven retorts, and after a few weeks' working the top retort of the older bed fell to pieces, and the other bed was not long in following suit. As was surmised, the retorts were found to be without any struts or jams—sufficiently explaining what had happened.

Even if retorts in small works are not subjected to worse usage than in large ones, there is at any rate the want usually of experienced labor to make good the defects of wear and tear, they should be set on the best possible plan, and with particular regard to stability; but, as already said, as their building is generally done by men unaccustomed to such work, the setting or plan should not be too complicated.

It is frequently found in such works that the arrangement is bad in respect of the number of retorts set together. There will probably be, say, two beds of three each, as in the case just referred to, instead of the six retorts being divided into one, two, and three, to suit the varying requirements of the year; so that at certain seasons they cannot be charged regularly, resulting in bad gas, unnecessary consumption of fuel, injury to the retorts, and waste of coal by the gas escaping through the inevitable cracks in the retorts when just charged after lying off for a time.

It is very desirable, too, that there should be one iron retort set separately in every small works, for the convenience of being brought into action in emergencies, as it is much less liable to injury by lighting up and letting down than a clay one. When properly protected from the direct action of the furnace flame, as shown by the drawing on view, such a retort, with occasional short spells of work, will last for years, if care be taken to exclude air when let down. It possesses the great advantage of being absolutely tight, so that when ready to be charged all the gas from the first goes into the holder, instead of the production of the first two or three charges going mainly up the flue, as in the case of a clay retort so used—a matter, at such a juncture, of the first importance.

The drawings exhibited show both the horizontal and vertical ways of heating, two and three chambered arrangements being respectively illustrated in the latter system. It will be seen that the retorts in each plan are so well strutted as to greatly strengthen the structure, and make it almost impossible, in case of cracks in the retorts, for a piece to fall out of its place, and enables cracks to be easily filled up.

It will also be observed that the furnaces are proportionately somewhat larger. That is found to be desirable to enable the man in charge to leave for a considerable time to attend to outside complaints, etc. Their sides, too, are sloped to a minimum width at the fire-bars, which prevents influx of cold air as the furnace charge burns away, by the coke sliding down and

keeping the air spaces covered until nearly the whole is consumed. The protecting arches, as will be seen, are not disturbed by the relining of the furnaces.

Among the exhibits will be found an unfinished, hastily-made drawing of a peculiar arrangement of three retorts, by my friend Mr. Littlehales, designed for arches too small to admit of the retort being disposed in the ordinary way. It may bescribed as a setting of four (one of which is on view), with the furnace occupying the space of one of the lower retorts. By this contrivance three can be set in a narrower arch than could be done with the furnace in the usual position. The setting is otherwise a three chambered one. He has, during the last few years, set several beds on this plan, which have been found to give entire satisfaction, both as respects heating and life of the retorts. It is a happy idea, which the writer had not seen or heard of before.

Although the drawings are intended more particularly as examples of settings applicable for small works, there are also settings shown of five and six retorts respectively, as examples of the principles of some of the smaller settings extended to larger ones.

The paper was accompanied by a large number of drawings, which were placed upon the blackboard.

Major Dresser—Mr. Littlehales desires me to say that if any member of the Association wishes any explanation of these drawings he will be very happy to give it, as he is entirely familiar with them.

Mr. C. A. White—I move that the thanks of the Association be tendered to Mr. Cathels for the paper to which we have just listened.

Carried.

The President—Mr. Page is now in the room, and the gentlemen of the Association will now listen to an address by him upon the subject of the "Distillations of coal Tar."

Mr. Page then came forward and addressed the Association.

[The publication of Mr. Page's remarks in full is unavoidably delayed.—Ed.]

Mr. Page's address was illustrated by a large number of beautiful specimens of aniline dye-stuffs, the products of distillation of coal tar.

Mr. Forstall—I move that the thanks of the Association be extended to Mr. Page for his highly interesting and instructive paper.

The President—I am sure that every gentleman who has listened to the remarks that Mr. Page has made will heartily concur in the motion made by Mr. Forstall. The matter has certainly been presented in a most charming and interesting way.

The motion was then put and carried.

The President—I will say that last July I had the pleasure of visiting the Beckton Works, in London. I was taken through the yard and around the works, and was also taken through the chemical department. There I found they had made lakes of pitch. The pitch from the works ran into these lakes, and they were of great extent. They were making sulphate of ammonia on a very large scale, and they were also making anthracene; and they told me it was worth about £125 per ton, or about $650.

Mr. Page—The commissions and insurance are $10,000 a year to go over there and sell it.

The President—Do you find the market satisfactory?

Mr. Page—If we did not, we could not be carrying on the coal tar business.

The President—Is it not true that this anthracene is taking the place of madder in this place and abroad? I do not know how far the alizarine from anthracene has taken the place of alizarine from madder, but, I suppose, to a very large extent. Perhaps Mr. Page can tell.

Mr. Page—Ninety-five per cent.; and the whole madder industry is gone.

The President—Its place has been taken by this product of coal tar called anthracene? The matter is now open for inquiry and dicussion; and I have no doubt that Mr. Page will be glad to answer any questions that may be asked of him.

Capt. White—Will he answer mine?

Mr. Page—Centainly.

The President—What is your question, Capt. White?

Capt. White—I merely wanted to know whether the manufacturers of this product are *madder* than they were before?

Mr. Page—They are not as mad as they were, because they are beginning to make money out of it. The patent has seven years to run, and after it has expired we can turn out this alizarene in this country in about six weeks.

Mr. Greenough—I would like to inquire of Mr. Page whether he has ever used coke to make his bricks.

Mr. Page—If I had had the time I would have referred to that subject. Undoubtedly there is no more interesting place for a gas engineer to visit than the works at Rondout. You will find the gentlemen in charge there very hospitable, and they will show you every attention. You will see there a very simple apparatus for making these bricks. It is a simple machine, but it does its work perfectly. You will see that you will be able to utilize your breeze, which I believe is now from twenty to twenty-five per cent. loss.

The President—How much do they cost.

Mr. Page—I cannot say, because no small ones have been put up. I believe they have a small one manufactured. After seeing the apparatus in operation there you can form an idea for yourself about what it will cost. It is simply a brick machine; that is all, except it is on a heavier and larger scale. He takes the coal dust from the canal boat on one side, and it comes out 15-pound bricks on the other side of his dock. Four men stand at the end of the machine and take out the bricks. They follow each other all the way along.

The President—In regard to the use of those bricks—are they exclusively used on railroads?

Mr. Page—Yes, sir; it is all used on locomotives. It is now used on several railroads.

The President—It is made from the dust of anthracite, is it?

Mr. Page—Yes, sir; ninety per cent. of waste coal dust right from the mines; 100,000 tons have been sold within the last three years. The industry is but three years old. We made 400 tons of this brick four years ago, to see if it could be successfully put in competition with anthracite. We proved that it could be, and since that time there have been 100,000 tons of this compound made and sold, and the gentlemen who are manufacturing it do not do business at a loss.

Mr. Merrimon—Can you utilize bituminous dust?

Mr. Page—Certainly.

Mr. Greenough—In the Paris works they break up their coke.

Mr. Page—Yes, sir; they have the apparatus to do it.

Mr. Greenough—Do you think that would pay in this country?

Mr. Page—I think it would, even now, if you did not sell it for 8 or 9 cents.

The President—I understood you to say there was tar with it.

Mr. Merrimon—How much tar is used in a ton?

Mr. Page—Ten per cent.; that would be 224 pounds.

The President—If there are no further inquiries to make of Mr. Page, I will state that Prof. Love is here, and has a paper that he will read.

Prof. Love—At the suggestion of the Secretary of the Association I prepared, somewhat hastily, a short paper on "Standard Burners," which, with your permission, I will now read.

Prof. Love then read his paper, as follows:

STANDARD BURNERS.

The question of a proper burner for testing the illuminating power of gas has created about as much if not more discussion than that of a proper standard with which to compare the illuminating power.

In 1849 Parliament first legalized a standard of the illuminating power of coal gas. The burner was described as an argand of 15 holes, consuming 5 cubic feet of gas per hour, and having a seven-inch chimney. The candles were made of wax, six to the pound, and, as at present, intended to burn 120 grains per hour. In 1850, Dr. Letheby was appointed the first gas examiner, and to him are due many of the improvements in photometric work. Two years after his appointment, the sperm candle was substituted for the wax, and a plaited wick used.

The first Public Act fixing a standard of illuminating power was the Metropolitan Gas Act of 1860, in which the burner prescribed was an argand of 15 holes, consuming five cubic feet of gas per hour, and having a 7-inch chimney; the standard of illuminating power was continued at 12 candles, and the candles employed were made of sperm. It will be readily seen that with these very imperfect specifications as to what the standard burner should be, a great variety of burners could be constructed, each conforming to that mentioned in the Parliamentary Act. Nothing was said about the size of the apertures, and their distance apart, the diameter of the channel through which air was supplied to the interior of the flame, no diameter of chimney given, and so on. As might have been expected, burners were made which did not show more than 50 per cent. of the illuminating power of the gas. It was noticed, however, that the smaller the holes and the greater the pressure, the lower the illuminating power; and, also, that as the channel for carrying air to the interior of the flame increased in size, the illuminating power was diminished. With this knowledge as to what a burner should not be, it became merely a matter of patient study and experiment to make a burner what it should be.

The Birmingham and Staffordshire Gas Act, of 1864, contained a feeble effort to describe a standard burner; but it was still incomplete, although an improvement on those preceding it. The Birmingham burner, although well-suited to a 14-candle gas, for which it was designed, proved unfavorable to the gas if the illuminating power was greater or less than this.

The Lemington, Dublin and other burners were used more or less as standards; but the burner containing more good qualities than any other that had preceded it, and one which at the present time is quite extensively used, was that designed by Dr. Letheby, and made by Mr. Sugg, and now known as the Sugg-Letheby burner.

In the "City of London Gas Act," of 1868, an entirely new departure was made. By it Gas Referees were to be appointed, and, among other duties, they were to "prescribe the burner for testing the illuminating power of the gas," which burner should be "most suitable for obtaining from the gas the greatest amount of light, and be practicable for use by the consumer."

The result of this Act was the adoption, in 1870, of a burner constructed by Mr. Sugg, and known as "Sugg's London Argand, No. 1." He gave the matter much careful study. The pressure under which the gas was supplied to the burner was greatly reduced; the air supply to the interior of the flame was carefully regulated by the diameter of the air hole in the centre, while the air supply to the exterior of the flame was regulated by the length and diameter of the chimney; the temperature of the burner was also greatly reduced. While with a Sugg burner the pillow becomes heated to a distance of two or three inches from the top, with a Sugg's London the gas channels of the burner itself are not even warm.

"Calling the old test burner used from 1852 to 1863, 100, the steatite burner used from 1863 to 1869, equaled 111.1, while the Sugg's London equals 128."

The burner now used by the Gas Referees in London is practically the same as that adopted in 1870, and some changes in the dimensions of the chimney have been made.

There are three elements to be considered in the construction of a standard burner, or any burner calculated to utilize to the fullest extent the power of the gas:

1st. Size and number of holes.

2d. Air supply.

3d. Chimney.

I am speaking now of burners of the argand pattern.

First, The size and number of holes.—With common coal gas (say 16-candle gas) the holes can be of larger diameter and fewer in number as the illuminants are in moderate quantity, and too great surface of flame must not be exposed to the oxidizing action of the air. With richer gases the case is different. Here we have a larger per centage of illuminants, and the object is to spread out the flame and allow the air a fair chance to bring the carbon particles to incandescence. Hence the number of holes is increased and they may be of smaller diameter.

Second. The second and third elements (air supply and chimney) are closely related, because as we vary the dimensions of the chimney we vary the supply of air. The air supply is really the most important consideration, for on it depends the development of the maximum amount of light. A rich gas can stand and needs more air than a poor gas, inasmuch as in the rich gas we have more matter to be oxidized. The heated column of air caused by the burning gas creates a current of the surrounding air towards itself. This drawing in of the air is increased with an increase of the velocity with which the gas issues from the apertures.

This increase of the air supply results in a more rapid combustion of the gas. It is possible to make the combustion too rapid, in which case the gas is overburned. On the other hand, if the combustion is not rapid enough, a loss of light ensues, and we say the gas is underburned.

As the combustion becomes more intense (by increasing the air supply) the *intensity* of the luminous portion of the flame increases, although the *extent* of the luminous portion is continually decreasing.

With a deficiency of air the flame temperature is too low, and when there is too much air, its inert nitrogen is heated at the expense of the flame, and the carbon particles, mingled to a greater extent with the air, pass through the incandescent state too rapidly, or it may be the flame temperature is too low on account of the excess of air. There is a point then at which the carbon particles receive just the amount of air necessary to develop the maximum of light, and below and above which the gas suffers.

Third. It is evident that as the chimney is increased in length or width, a greater quantity of air is drawn in on the flame, and so it may be over or underburned, according as the chimney is too large or too small. The flame will give its maximum of light on the verge of smoking.

There never has been a standard burner in the proper acceptation of the term. One burner after another has been adopted in certain sections because the newcomer was supposed to give more satisfactory results than its predecessors. This country has not, and never has had, any one burner which, by general consent, was accepted as a so-called standard.

In England much more attention has been paid to the subject, and since the Gas Act of 1868 a certain burner has been adopted which utilizes the power of the gas so far as our knowledge of the principles involved will enable us to construct one. This same burner is not used by all gas corporations in England even, and hence cannot properly be called a standard in the same way that we speak of standards of weight and measure. We have the Sugg's London, the Sugg-Letheby, and many more, each dubbed "standard." It probably never will be possible to decide on any one burner, and, except for the advantage of comparison, it is of little moment. In this country if every gas company made the same kind of gas, and in the same way, we might settle on some one burner, but variety seems to be the order of the day. Burners were made for gas, not gas for burners, and it is very important to select a burner which is suited to the gas it is used to test. A burner adapted to a 16-candle gas will not burn one of 14 or 18 candles without injury to the gas. Sometimes it is possible to correct the evil by using a chimney of different dimensions.

Such is the case in using the burner prescribed by the Referees in testing the gas of London. If in testing a 14-candle gas by this burner it shows a tendency to tail over the chimney, the latter is changed for one of a slightly increased diameter. It then becomes an interesting question as to how far it is possible to decide on a burner which a majority of gas corporations can use to advantage. If one has always used the Sugg-Letheby burner, he could always continue doing so, and be able to compare the quality of his gas to-day with that of six months or a year previous. But if one company uses a Sugg's London, and another a Sugg-Letheby, there is no means of comparison, except as we know in a very general way, the increased illumination given by Sugg's London over the Sugg-Letheby.

Further than this the question arises, and a question of much more scientific interest, How much light can be obtained from a given gas under the most favorable conditions. In these times of close competition no gas corporation can afford to lose two or three candles illuminating power in the burner.

Every illuminating gas contains elements which, under favorable conditions, will emit a certain amount of light.

The burner does not increase this light-giving power contained in the gas, but simply utilizes it to a greater or less extent, according to the adaptability of the burner to the gas.

That the gas company has a right to employ, in testing for illuminating power, the burner which will show its gas to the best advantage, is a fact generally conceded, and one which few, if any of you, will question. The intelligent consumer, on the other hand, has a right to demand that these tests be made with a burner which he can readily obtain. In other words the company has no right to employ a burner of intricate construction, one likely to get out of order, or one so expensive as not to be within the reach of consumers. In most cases it will be found that the use of poor burners is occasioned more through ignorance than any inability to procure good ones.

In England, of late years, great advancement has been made in the use of proper burners by consumers, and burners similar to those prescribed by the Referees can be readily obtained. We hear little of English burners in the hands of consumers in this country because there is little thought given to the subject, and hence little demand for any other than the most simple forms. They are not so expensive, however, as to preclude their use in photometric work so far as it may be advantageous to employ them.

The question is—can a burner be wisely adapted for use by a large number of gas companies, unless there is some approach to equality in the gas manufactured by them. If one company makes a gas of 14 candles, and another company one of 18 candles, certainly no one burner can be used advantageously for both. If there were some standard of illuminating power, say 16 candles, and the different companies endeavored to keep near this, a burner could be easily selected which within reasonable limits would answer for all. If a burner were to be adopted for what are known here as naphtha gases, it would need to be something different from that for coal gas. In England the Referees prescribe an Argand burner for common coal gas, ranging from 14-candles to 16-candles, and a batwing burner for cannel gas (ranging from 23 to 28 candles.)

I have had occasion to make some experiments on the subject in connection with a proposed change of burner in testing the gas of New York city, and, without occupying your time with details, will mention some of the conclusions to which I have been drawn.

New York is especially fortunate or unfortunate in the great variety of illuminating gases offered to the public. At present (and ever since the city has had testing stations under its control) the Sugg-Letheby burner has been employed for all gases alike. That this burner was not doing full justice to any, and great injustice to some, of the gases tested by it was evident to every one; but, for certain reasons, no change seemed possible at the time. And even now, that a change is contemplated, it is a most perplexing question to decide what burner or burners to adopt. To adopt one burner for all would be ridiculous. In the first place, there are gases like the New York and Harlem having an illuminating power of 16 to 17 candles (tested by the Sugg-Letheby) and whose specific gravity is that of ordinary coal

gas (.430 to .480); then there are coal gases corresponding very nearly or quite to the cannel gas of London, with a comparatively low specific gravity and high illuminating power, like the Manhattan (illuminating power 17 to to 18.50 candles by Sugg-Letheby burner, and specific gravity .450 to.500); and lastly those gases enriched with naphtha having a high specific gravity (.650 to .750) and high illuminating power. Up to the present time I have limited my experiments more especially to the first class or common coal gases, as to this class belong the majority of illuminating gases of this country. Perhaps the average gas is more nearly equal to the English coal gas—from 14 to 16 candles illuminating power. For gases of this nature undoubtedly the best results can be obtained with Sugg's London Argand adopted by the Gas Referees. It is provided with a chimney, $6'' \times 1\frac{5}{8}''$ for 14 candle gas, and another $6'' \times 1\frac{7}{8}''$ for 16 candle gas.

Gases which test from 16 to 17 candles by the Sugg-Letheby burner cannot be tested by the Referees' burner without some loss, as in every case I dave tried, the flame tailed over the chimney. Tests were made with the Referees' burner and a chimney $7'' \times 1\frac{7}{8}''$, and good results were obtained; but, as will be seen later on, the maximum of light was not reached.

Experiments were made with Sugg's "E," "F," and "G" burners. Excellent results were obtained with the "E" burner, but with burners "F" and "G" the gas was undoubtedly overburdened, for the illuminating power was below that of the "E." It is to be borne in mind that these burners are designed for a certain consumption of gas (the "E" for 5½ cu. ft.; the "F" for 6¼ cu. ft.; and the "G" for 7 cubic feet per hour), and it is hardly to be expected that they would give the best results when burning smaller quantities.

The following table shows some of the results obtained. Other experiments are in progress. The gas used in the testings was that of the New York Company.

The results given are the average of a large number of tests. The pressure of the gas as delivered to the burner varied from .15 inch to .30 inch, according as the bushing affixed to most of the burners was left in place or removed. In all cases, however, the pressure was reduced to a minimum consistent with an easy flow of gas. The tests were made with an hourly consumption of gas of five cubic feet, no matter what the capacity of the burner—

Burner.	Dimensions of chimney in inches.	Illuminating Power.	Illuminating power by Sugg-L'th'by burner.	Difference candles.
First Series.				
Sugg's London Argand, No. 1.	$6 \times 1\frac{7}{8}$	16.83	15.95	.88 tailed
" " "	$7 \times 1\frac{7}{8}$	17.02	15.95	1.07
"E" Burner	$7 \times 1\frac{5}{8}$	17.60	15.95	1.65
"F" Burner	$7 \times 1\frac{5}{8}$	17.40	15.95	1.45
"G" Burner	$8 \times 1\frac{5}{8}$	17.28	15.95	1.33
Second Series.				
Sugg's London Argand, No. 1.	$6 \times 1\frac{7}{8}$	16.38	15.64	0.74 tailed
" " "	$7 \times 1\frac{7}{8}$	17.16	15.64	1.55
Third Series.				
Sugg's London Argand, No. 1.	$6 \times 1\frac{7}{8}$	Smoked.	16.22	——
" " "	$7 \times 1\frac{7}{8}$	17.28	16.22	1.06
"E" Burner	$7 \times 1\frac{5}{8}$	17.80	16.22	1.58
"	$7 \times 1\frac{5}{8}$	17.20	16.22	0.98

From these tests it will be seen—

1st. That Sugg's London Argand No. 1, with a $6'' \times 1\frac{7}{8}''$ chimney, gave from .7 to.9 of a candle more than the Sugg-Letheby. This is low on account of the tailing of the flame.

2d. That the same burner with a $7'' \times 1\frac{7}{8}''$ chimney gave from 1.1 to 1.5 candles more than the Sugg-Letheby.

3d. That Sugg's "E" burner with a $7'' \times 1\frac{5}{8}''$ chimney, gave from 1.58 to 1.65 candles more than the Sugg-Letheby, while with a $7'' \times 1\frac{7}{8}''$ chimney the difference is equal to about 1 candle.

4th. That burners "F" and "G" gave from 1.4 to 1.3 candles more than the Sugg-Letheby.

5th. That with a gas of 15.50 candles, by the Sugg-Letheby burner most excellent results are obtained, by Sugg's London Argand No. 1, with a chimney $7'' \times 1\frac{7}{8}''$.

6th. That the Sugg-Letheby burner gives results about 1.5 candles below the burner giving the best results.

As to a suitable burner for rich coal gases and naphtha gases, I am convinced from a number of experiments that the burner which gives the best results with a rich coal gas will not burn the naphtha gases to the best advantage. A 5-foot batwing is used in testing London cannel gas (23 c. to 28 c.), the gas of Glasgow (28 c. to 30 c.), and in other places. While this burner gives good results with rich coal gas, it is not suited to naphtha gas. A naphtha gas requires a flat flame burner, the same as a rich coal gas, but one in which the slit is much narrower, so that the gas may be spread and a more intimate contact with the air offered. At the same time such a burner would over-burn rich coal gas. The simple matter of candle power is not the only element to be considered; the higher specific gravity of the naphtha gases is also to be taken into consideration.

Experiments on this point are in progress, and their results, together with the relations existing between the different burners, Sugg's illuminating power meter, and the jet photometer, will form the subject of another paper.

Capt. White—I move that a vote of thanks be tendered by the Association to Prof. Love for his exceedingly interesting and valuable paper.

Carried.

The President—The subject of Prof. Love's paper is now open for discussion.

Mr. Harbison—It was decided this morning that the next annual meeting of our Association should be held at Chicago. I am not aware that there has been any committee of arrangements appointed.

The President—I will do it now. I appoint Mr. Watkins, president of the Chicago Gas Company; Mr. Henry, a lawyer, also connected with the Gas Company there; and Mr. Thomas Butterworth, of Rockford, Ill.

Mr. Harbison—I move that the name of the Secretary of the Association, Capt. White, be added.

Carried.

Mr. Harbison—I would like to make a suggestion to the committee just appointed. I trust that some place will be selected in Chicago for holding our meeting where we will not suffer as we have in this and other places. It is exceedingly annoying to the members of the Association, as well as to the presiding officer, to be obliged to submit to the noise that is continually made by the moving of the chairs and the feet upon the bare floor. Every movement is heard. No one can come in or go out or change his seat without creating a great deal of noise and disturbance. I trust that the place of meeting next year will be free from this cause of complaint, and I hope the committee will be able to secure a room that has a carpet on the floor, so that we may have silence.

The President—Mr. Burtis, you hear the suggestion from Mr. Harbison, and you can communicate with Mr. Watkins upon the subject. The matter of standard burners is now open for examination and discussion.

The Secretary—Gentlemen of the Association: In a conversation with Prof. Love, which led to the paper being prepared to which you have just listened, and which contains suggestions and facts so interesting and so valuable, several thoughts occurred to me which I believed might be developed in a paper, and which would be of benefit to the members of the Association, to gas men, and to the public throughout the country. One thought that presented itself to my mind was whether or not a standard burner or burners might not be established by the action of the Association, and adopted and used by the different companies throughout the country in fixing a standard by which to measure the gas made, so that the companies would be able to make comparisons with each other and understand each other when the subject of candle power was discussed. A further thought suggested itself to my mind, and it was this: The gas interests of the country are, at some time, to be the subject of legislation, beyond all question; and if the gas interests of the country could present to the different Legislatures and legislators an intelligent knowledge of the conditions necessary to a fair development and a fair standard of the gas made, they might have something in their own hands to guide that legislation in the future to a large extent, and to relieve themselves, perhaps, from more or less oppression, by taking the initiative and acquainting the public and themselves as to what is necessary for a fair and just standard between themselves and the public. From the paper which has been read by Prof. Love I see that his opinion is that no one standard can be made, and no one burner can be used; but a series of burners might be used, or some plan be developed by inquiry and investigation by which a standard burner for a 14-candle gas may have one kind of chimney attached to it, and another burner for a 16-candle gas have another chimney attached to it; and so going through with the different qualities and kinds of gas. In this way you will be able intelligently to talk with each other and understand what each means when you speak of the respective candle power of the gas you make.

These are simply suggestions which have presented themselves to my mind in relation to the matter, and I would like very much to hear what other gentlemen think about it, and whether it is worth while to appoint a committee to investigate that subject and report at a future meeting. If we are going to make gas for 20 years longer, as Mr. Page thinks we are, I think it is very important that we should have the best burners, and have, if possible, a plan by which a standard can be arrived at.

Mr. Littlehales—This question of burners being under discussion, I think it will not be out of place for me to make few suggestions as to the desirability of gas companies, or the managers of gas works, taking a little more interest than is often done in the burners used by consumers. There is no doubt that a great deal of dissatisfaction is caused in the minds of consumers because they do not get good burners. Now, our company has for some time past been getting the best burners they could—not the highest-priced burners, of course, but such burners as our customers can afford to pay for. We sell them at cost price, and I believe it would pay every gas company to adopt that plan. Of one thing I am sure, and that is, that it would be to the interest of gas companies to look into this matter and see what can be done in the direction of furnishing good burners at a reasonable price to consumers. It very often happens when complaints in regard to poor gas are made, that investigation discloses the fact that the burners are poor, and that a change of burners often remedies the difficulty. Of course, the companies will not seek to make any profit out of the sale of burners, but will furnish them at cost price.

Mr. Starr—I have been doing that for the last four years; I give away burners; I never charge for burners furnished my consumers. I have furnished about 100 gross to customers. We try to get the best burners. Another thing that I do in putting the burners in is to regulate the size of the burners used in the different parts of the house. For instance, where there are bedrooms I recommend the use of a smaller burner, and in a sitting room, where a great deal of light is required, I recommend larger burners. I find that this system has worked well with us.

Mr. Sherman—I hope the suggestion that Mr. Nettleton has made, in regard to standard burners, will be carried out by this Association. I think a committee ought to be appointed to examine into this question. There is a great deal of ignorance in the community in regard to this matter of burners particularly. Every time the Legislature comes together, it is with fear and trembling on the part of the gas companies. We are liable constantly to hostile legislation; and I have frequently seen men who were unfriendly to gas companies go around and canvass the members of the Legislature, in order to get some provision of law in regard to the use of a test burner which would reduce the quality of the gas three or four candles. I therefore move, Mr. President, that a committee be appointed by the chair to investigate this subject of standard gas burners; and to ascertain, if possible, which would be the best burner to be adopted by all the companies.

Carried.

The President—I appoint Mr. Nettleton, Mr. Sherman, and Maj. Dresser as a committee.

Mr. Harbison—There is another matter that I for one should be glad to hear discussed before this meeting of the Association is closed. It is now getting late in the day, and it being the last day, this would seem to be the best opportunity for the expression of opinion on the part of the members in relation to heating and cooking by the use of gas stoves. I have been talking with a man who knows something about it and has had some experience. I understand that Mr. Goodwin, a member of the Association, and who is a manufacturer of gas stoves, has made some very important experiments, by way of comparison, between cooking by gas and by anthracite coal. I think the result of his experiments will be exceedingly interesting and instructive to us; and I move, Mr. President, that Mr. Goodwin be requested to favor the Association with the results of the experiments he has made.

Carried.

Captain White—Mr. President, the committee are ready to report upon deceased members; and, with your permission, I will now present that report. The committe to whom was referred the work of preparing resolutions upon deceased members of the Association beg leave to report that they are informed that there has been but one death during the current year—that of Wm. B. Clelland, for many years Secretary and Superintendent of the Vicksburg, Mississippi, Gas Light Company. Your committee submit the following:

The American Gas Light Association, holding its Seventh Annual Session in Philadelphia during October, 1879, learns with sincere regret that it has been called upon to mourn the loss of another of its active members, and to add to the sadly lengthening roll of deceased members the name of Mr.

WM. B. CLELLAND,

who was for many years the efficient manager of the Vicksburg Gas Light Company of Mississippi, and departed this life, October 10, 1878, a victim to the yellow fever.

While the Association could not hope to escape the sad affliction laid upon so many of our citizens during the terrible epidemic of 1878, it may console itself in the knowledge that the one who dropped from our ranks died at the post of duty, and sacrificed his life to what he deemed the manliest course.

The Association expresses to the family of Mr. Clelland its sincere condolence, and feels that the vacancy thus made in his family circle and business relations will be irreparable.

WM. HENRY WHITE,
G. WARREN DRESSER,
Committee.

The committee also desire to offer a resolution that this report of the committee be engrossed and sent to the family of the deceased and to the company with which our deceased associate served.

On motion the report was accepted and adopted, and the resolution passed.

Mr. Goodwin then read his paper as follows:

THE ECONOMY OF GAS AS A FUEL FOR COOKING PURPOSES.*

Mr. President and Gentlemen of the Association: I have not prepared a regular paper to be read, but I have a statement of facts—the results of some experiments in cooking—which I will present to the Association without comment. I have also prepared a tabulated record of tests made by boiling a given quantity of water over a flame composed of different portions of gas and air under varying conditions, in order to determine which was the best quantity of air to introduce with gas to secure the most favorable results.

My standard was 8 pounds of water. The gas was consumed at the rate of 10 feet per hour; the time required to raise 8 pounds of water from 73° to the boiling point was 28½ minutes, consuming 4.466 feet of coal gas. I would say here that I desinged an apparatus for furnishing air in a measured quantity, and mixing it with the gas before burning. That apparatus is so arranged that the gas and the air can be put into the burner in their normal condition, or the gas and the air can be heated both together or separately.

Tabular Record of Tests on Boiling Water over a Flame Composed of Different Proportions of Gas and Air, under Different Conditions.—Coal Gas, 16½-Candle Power. Weight of Water, 8 Pounds.

	No. Trial.	Temp. of Water.	Increase of Temp.	Time Required.	Gas Consumed.	Per Cent. Less Time.	Per Cent. Less Gas.
		Degrees.	Degrees.	Minutes.	Feet.		
Test No. 1—Pure gas at the rate of 10ft. pr. hour	1	70	132	28.5	4.5	.....	.....
	2	76	136	28.5	4.4	.....	.....
	3	76	136	28.5	4.5	.....	.....
	Av'ge	77⅓	134⅔	28.5	4.466	.....	.....
Test No. 2—1 volume of gas and 1 of air.	1	80	132	22.5	3.6	.....	.....
	2	74	138	23	3.6	.....	.....
	3	74	138	23	3.6	.....	.....
	Av'ge	76	136	22.83	3.6	20	19
Test. No. 3.—1½ volumes of air to 1 of gas.	1	78	134	22	3.4	.....	.....
	2	76	136	22.25	3.5	.....	.....
	3	76	136	22	3.5	.....	.....
	Av'ge	76.6	135.3	22.08	3.46	22.5	22
Test No. 4—2 volumes of air to 1 of gas.	1	79	133	21	3.3	....	.....
	2	76	136	21.5	3.4	.....	.....
	3	76	136	21.5	3.4	.....	.....
	Av'ge	77	135	21.3	3.32	25	25.5
Test No. 5.—2 1-6 volumes of air to 1 of gas.	1	71	141	21.25	3.3	.....	.....
	2	74	138	22	3.5	.....	.....
	3	76	136	21	3.2	.....	.....
	Av'ge	73.66	138.3	21.4	3.3	26	26.1
Test No. 6.—2 1-6 volumes of cold air to 1 of heated gas.	1	73	139	28	4.1	.....	.....
	2	74	138	26	3.8	.....	.....
	3	74	138	27	3.9	....	.....
	Av'ge	73.66	138.33	27	3.93	5.2	11
Test No 7.—2 1-6 vols. of heated air to 1 of heated gas.	1	74	138	27	4.0	....	.....
	2	74	138	26.5	3.9	... .	.....
	3	74	138	26.75	3.9	.....	.....
	Av'ge	74	138	26.75	3.93	6	11
Test No. 8.—2 1 6 vols. of heated air to 1 of cold gas.	1	74	138	26.5	3.9	....	.....
	2	75	137	26.25	3.8	.....	.....
	3	76	136	26	3.8	.....	.....
	Av'ge	75	137	26.25	3.83	7.8	12

In the first test the the gas was cold and the temperature of the water was 77½° F.

After determining the quantity of coal gas required to boil 8 pounds of

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water, I mixed various quantities of air with the gas, and obtained the following results, each test named being an average obtained from three trials, viz.:

In the second test 8 pounds of water were used and one volume of air and volume of gas. The quantity of gas consumed was 3.6 feet. In that case the boiling point was reached in 22.83 minutes, being 20 per cent. less time required and 19 per cent. less gas than in test No. 1.

The third test was 1½ volumes of air, 1 volume of gas, and the same quantity of water. Time. 22.08 minutes; gas consumed, 3.46 feet, or 22½ per cent. less time and 22 per cent. less gas than in the first test.

The fourth test was 2 volumes of air and 1 of gas. Time, 21.3 minutes; gas consumed, 3.32 feet; or 25 per cent. less time and 25½ per cent. less gas required than in the first test.

The fifth test was 2½ volumes of air and 1 of gas. I will state that I found the best results were obtained with this mixture. It has been found, in Europe, that 2 1-5th volumes produce the most favorable results. The candle power of the gas has something to do with it, I presume. This is certainly a very close comparison. In this test the quantity of gas consumed was 3.3 feet; the time occupied was 21.4 minutes; or 26 per cent. less time and 26.1 per cent. less gas required than in the first test.

In the sixth test the gas was heated, and the time went up to 27 minutes; quantity of gas consumed, 3.92 feet; reducing the time to 5.2 and the gas to 11 per cent.

The seventh test was heated gas and heated air. The time required was 26¼ minutes; quantity of gas consumed, 3.93 feet; or 6 per cent. less time and 11 per cent. less gas.

The eighth test was heated air and cold gas. Time, 26¼ minutes; consumption of gas, 3.83 feet; or 7.08 per cent. less time and 12 per cent. less gas.

In tests Nos. 6, 7, and 8 the air and gas were heated separately in coils of copper pipe over separate flames, arranged so that the air or the gas could pass through the coils or not, as was desired. Each of these coils had a heating surface of 472 square inches, and in the tests the tubes were heated to redness. The conclusion is that the best condition for burning gas, according to these tests, is—2½ volumes of air and 1 volume of gas, and both of them in their normal condition, or cold.

Cooking Test.—Made between a No. 8 Peerless Range and a No. 7 Sun-Dial Gas Stove.

I have also copies of tests that were very carefully made a few days ago—made as carefully as I knew how to make them, of the difference in cooking between a regular range and a No. 7 gas stove. The articles cooked were twelve in number, and were cooked so that they were all ready to place upon the table at once.

The range used was a No. 8 Peerless Range. The articles were weighed before cooking, and also after cooking, and the percentage of loss in weight and the time required were carefully ascertained. For instance, a 3-pound bluefish weighed 2 pounds and one ounce after cooking in the range—being a loss of 32 per cent.; time, 31 minutes. In the case of the gas stove it weighed, after cooking, 2 pounds 6 ounces. To be more explicit, I took two bluefish, each weinging 3 pounds, and cooked one in the range and one in the gas stove, with the results I state. The time required for the cooking of the fish in the gas stove was 35 minutes, 4 longer than the time required for cooking it in the range. The loss was 20 per cent., or a saving of 12 per cent. in favor of the gas stove.

A rib of beef weghing 9 pounds 7 ounces, weighed 6 pounds 8 ounces when cooked in the range; a loss of 32 per cent.; the time was 1 hour and 37 minutes. In the gas stove the time was 1 hour and 25 minutes; loss, 17 per cent.

To show how close these tests are with some made in England, I will state that the average was found to be 33 per cent. loss in cooking in the ordinary way, and 15 per cent. on the gas stove. My tests show a loss of 32 per cent. on the range and 17 per cent. on the gas stove—another very close comparison. A 3 pound and 1 ounce chicken, cooked in the range, weighed 2 pounds and 2 ounces when cooked; loss, 30 per cent.; the time was 1 hour and 6 minutes. In the gas stove, time, 1 hour; weight when cooked, 2 pounds 10 ounces; loss. 14 per cent. A 1 pound 2 ounce beefsteak weighed, when cooked in the range, 13½ ounces; loss, 25 per cent.; time, 11 minutes. An equal weight of beefsteak cooked in the gas stove weighed when cooked 15 ounces; time, 8 minutes; loss, 16⅔ per cent. Each of these articles as I have said, was weighed carefully before cooking, and was weighed immediately after being brought out of the stove or range. Lamb chops weighing 1 pound and 1 ounce, weighed 11 ounces after being cooked in the range; a loss of 35 per cent.; time, 12 minutes. In gas stove, an equal weight of lamb chops, after cooking, weighed, 13½ ounces; time, 10 minutes; loss, 15 per cent. There was also in each case 3 pounds and 5 ounces of sweet potatoes, 3 pounds and 8 ounces of white potatoes, 3 pounds and 12 ounces of cauliflower, and 4 pounds of tomatoes. These articles were all cooked in a steamer. Bread baked in the range, 5 pounds and 2 ounces, in 46 minutes; in the gas stove, 37 minutes. Sago pudding, 3 pounds 5 ounces, 27 minutes in the range; in the gas stove, 28 minutes. Lemon pie, 2 pounds 14 ounces, 30 minutes in the range; on the gas stove, 22 minutes. In these articles no change of weight was noted. There were also prepared, sauces for the fish, the beef and the cauliflower. The total time from the lighting of the fire in the range until everything was ready to serve was 2 hours and 40 minutes. Of this time, 30 minutes were required to heat the oven, leaving 2 hours and 10 minutes as the actual cooking time. The weight of the coal, including the lighting of the fire, was 44 pounds. At the end of that time the fire was ready for more coal. The 44 pounds of coal, at $5.50 per ton, cost 10.95 cents, the kindling wood one cent, making a total of 11.95 cents.

Gas Stove.

The total time from lighting the gas until everything was ready to serve on the table was one hour and fifty minutes; the consumption of gas, by a test meter, was 38 feet. At the price of $2.15 the gas cost 8·17 cents, against 11.95 cents in the case of the range. The gas was lighted in the roasting chamber at 11 o'clock; 4 minutes after lighting, the beef and chicken were put in the roasting chamber; at 7 minutes past 11, the bread was put in the oven on the lower shelf; at 10 minutes past 11, the pie was put in on the upper shelf; at 16 minutes past 11, the water was put in the steamer cold, for cooking the vegetables; at 25 minutes past 11, the vegetables were put in, the cauliflower being at the bottom of the steamer, and the potatoes on the shelves; this steamer was over one of the burners of the hot plate, the other being used to stew the tomatoes and make the sauces. After the pie was baked, the pudding was put in on the lower shelf, the bread was removed to the upper shelf to brown on top; after the bread was baked the fish was put in the oven. After the meat and chicken were roasted the steak and chops were broiled. You will observe that so far as the actual cost or expenditure for fuel is concerned—and that it seems to me is one of the points that we are considering—the comparison is as 8.17 cents is to 11.95 cents. But there is another very important question connected with these tests, and that is the comparison in the percentage of loss in the food that was cooked in the range as against that cooked on the gas stove. The cost of the fish was 35 cents. It showed on the range a loss of 10½ cents; on the gas stove it showed a loss of 6½ cents; consequently, there was a saving in the weight of the fish as between 6½ cents and 10½ cents—a saving of 3¾ cents on the weight of the fish. The beef cost $1.69. After it was cooked on the range it was worth $1.17 cents, showing a loss of 42⅞ cents. On the gas stove the loss was 28½ cents, or a saving in favor of the gas stove over the range of 14⅜ cents. The loss in the weight of the chicken was 17½ cents; in the gas stove it was 8¾; showing a saving over the range of 8¾ cts. The steak lost 6 3-16 cents in the range, and 4¼ cents in the gas stove—a saving of 2 1-16 cents. The loss on the chops was 7½ cents in the range, and 3½ on the gas stove—a saving of 4 3-5 cents. The total saving of the gas stove over the range, in food lost, was 33 11-16 cents. These are the facts. (Applause.)

The following are the foregoing facts, in tabular form, arranged for comparison:

Record of Peerless Range No. 8.

Article.	How Cooked.	Weight. Before Cooking.		Weight. After Cooking.		Loss. Per ct.	Time.	
		lbs.	oz.	lbs.	oz.		h.	m.
Bluefish	Baked.	3	0	2	1	32	0	31
Rib of Beef	Roasted.	9	7	6	8	32	1	37
Chicken	Roasted.	3	0	2	2	30	1	6
Beefsteak	Broiled.	1	2	0	13½	25	0	11
Lamb Chops	Broiled.	1	1	0	11	35	0	12
Sweet Potatoes	Steamed.	3	5					
White Potatoes	Steamed.	3	8					
Cauliflower	Boiled.	3	12					
Tomatoes	Stewed.	4	0					
Bread	Baked.			5	2		0	46
Sago Pudding	Baked.			3	5		0	27
Lemon Pie	Baked.			2	12		0	30
Sauces for fish, beef, & cauliff'r								

Total time from lighting of fire until everything was ready to serve 2 hours and 40 minutes. Of this time 30 minutes was required to heat the oven, leaving 2 hours and 10 minutes actual cooking time. Weight of coal including lighting of fire 44 lbs. At the end of the time the fire was ready for more coal. Cost of coal, 44 lbs., at $5.50 per ton, 10.95 cents. Kindling 1 cent. Total, 11.95 cents.

Record of No. 7 Gas Stove.

Article.	How Cooked.	Weight. Before Cooking.	Weight. After Cooking.	Loss. Per ct.	Time.
		lbs. oz.	lbs. oz.		h. m.
Bluefish	Baked.	3 0	2 6	20	0 35
Rib of Beef	Roasted.	9 4	7 11	17	1 25
Chicken	Roasted.	3 1	2 10	14	1 0
Beefsteak	Broiled.	1 2	0 15	16⅔	0 8
Lamb Chops	Broiled.	1 0	0 13½	15	0 10
Sweet Potatoes	Steamed.	3 5			
White Potatoes	Steamed.	3 8			
Tomatoes	Stewed.	4 0			
Cauliflower	Boiled.	3 12			
Bread	Baked.		5 7		0 37
Sago Pudding	Baked.		3 3		0 28
Lemon Pie	Baked.		2 14		0 22
Sauces for fish, beef, & cauliff'r					

Total time from lighting of gas until everything was ready to serve, 1 hour 50 minutes. Consumption of gas by test meter, 38 feet. At $2.15 per thousand feet, cost, 8.17 cents.

Table of Comparison of Percentages in Loss after Cooking.

	Gas Stove.	Range.
Fish	Cost, 35 c. / Product, 28½c. / Loss, 6½c.	Cost, 35 c. / Product, 24¼c. / Loss, 10¼c.
	Saving of gas stove over range, 3¾ cents.	
Beef	Cost 166½c. / Product, 138⅜c. / Loss, 28⅛c.	Cost, 169⅞c. / Product, 117 c. / Loss, 42⅝c.
	Saving of gas stove over range, 14¾ cents.	
Chicken	Cost, 61¼c. / Product, 52⅛c. / Loss, 8¼c.	Cost, 60 c. / Product, 42½c. / Loss, 17½c.
	Saving of gas stove over range, 8¾ cents.	
Steak	Cost, 24¾c. / Product, 20⅝c. / Loss, 4⅛c	Cost, 24¾c. / Product, 18 9 16c. / Loss, 6 3-16c.
	Saving of gas stove over range, 2 1-16 cents.	
Chops	Cost, 20 c. / Product, 16⅞c. / Loss, 3⅛c.	Cost, 21⅛c. / Product, 13¾c. / Loss, 7⅛c.
	Saving of gas stove over range, 4⅜ cents.	
	Total saving, 33 11-16 cents.	

Mr. Harbison—I have listened with the greatest interest to the statement which Mr. Goodwin has just made. I think it has really been of more value than any other subject that has come up during the meeting. We have got here some practical information, and it seems to me that every engineer and every man connected with gas works who desires to increase his consumption should give the most careful attention to the subject that has been presented in so interesting a manner by Mr. Goodwin. I think, Mr. President, it would be well if we could get this statement from Mr. Goodwin in such a form as that it could be printed and distributed; and I think if we can do that it would be better to pass a resolution directing that a certain number of copies be printed and distributed among the members of the Association, then each of us can personally take such action as we think best. I think it would be well for the Association to print 500 copies, and for each member to have two copies of this valuable information; then each of us can make such tests and ascertain such results as he feels disposed. I therefore move, Mr. President, that the Secretary be requested to obtain this statement of facts from Mr. Goodwin, and that it be published at an early day, and two copies be distributed to each member.

Carried.

Mr. Goodwin—I have simply given you the figures. I do not propose to comment upon them at all.

Mr. Harbison—I did not mean by anything I said to advertise the Sun Dial Gas Stove, or any other article manufactured by Mr. Goodwin's house. I do not mean for one moment to be understood as an advocate of any particular kind of stove; but what I say is that the statement made by Mr. Goodwin is a very valuable one, and I think it contains information which is of the greatest value to every member of this Association who has anything to do in the management of gas companies, and who desires to find means to increase his consumption; and my object in making the motion that I did was to provide some means of distributing this information in a printed form among the members, so that we might have an opportunity of pursuing the subject further if we so desire.

Mr. Helme—There is a gentleman present who has also been experimenting in that direction, and I think he will be able to give us some facts of interest on the subject. I refer to Mr. Hawley.

Mr. Hawley—I shall be very happy to give the Association such information as I can in regard to this subject; but I shall confine myself to a practical view of it. What all of us who are interested in this subject want to know is how the gas companies can encourage heating and cooking by gas, and the best manner in which to extend the use and sale of their gas for that purpose.

I assume, for the purpose of what I have to say, that there is a great field open for gas companies to occupy, and that is the promotion of heating and cooking by gas. I have had some considerable experience in this matter, and have had an opportunity of witnessing the practical working of gas stoves. In small houses, where the wife has to do all the cooking, and in boarding houses or small rooms, where persons prefer to cook for themselves, there is a great field for a good gas stove, that is, so far as cooking is concerned. I think, before I finish these remarks, I will convince the members of the Association that for heating purposes there is an equally wide field for a gas stove. I mean in the way of heating bath rooms, or butler's pantries, or hall bedrooms. I will venture to say that in the territory of almost any gas manager, and especially those who are located in large cities and towns, there are a large number of houses where there is either a bath room, or a butler's pantry, or a hall bedroom, or some place of that kind, where a gas stove for intermittent use would please the people, and could be easily introduced. I think, also, you will agree with me, before I have closed, that there is also a wide field for the use of gas for heating purposes in our hotels. You go to a hotel now and ask for a fire, and you are charged 50 cents or $1.00 for it. It is a great nuisance, and dirties up the room, and every time the fire is mended or replenished the coal dust and ashes are deposited everywhere. Now, a gas stove that would not vitiate the air could be put into hotels, in the smaller rooms, and, with gas at $2 per thousand, they would not cost more than 23 cents, even if the occupant of the room burned the gas all night, and it would not cost as much as it would for the coal fire.

This being so, the question arises, if these stoves are so convenient and so inexpensive, why do the public not take them? I will endeavor to answer that. The public will certainly take them if they are introduced in the right way. An evidence that such an article is just what is needed is found in the fact that there are millions of oil stoves in use in the United States to-day, for cooking purposes in the summer time and for heating small rooms. They are not found in great houses; but for small rooms and apartments they are in great demand. We all know what an unpleasant smell there is about them, and how great a nuisance they are. This being so, why are they so extensively used? It is because the desire to get rid of the range in summer time is very great; and because there is such a natural demand for some article of this kind that will heat small rooms. Again, there is a prejudice against using gas for this purpose. Why? In the first place, if you will allow me to say so, gas companies are very indifferent about this matter. They have not endeavored to assist the public in adopting them at all.

In many cases that I have heard of where the gas bill was large, the company would ask the consumer, "Haven't you a gas stove?" "Yes." "Oh, well, that explains it all. You must not talk about a large bill if you have a gas stove!" That sort of reply answers the purpose, but it creates a prejudice against the use of gas for cooking or heating purposes which is very hard to overcome. Again, the fact that there is so much uncertainty in the use of gas for heating and cooking purposes is another element that goes toward creating a prejudice in the minds of the public. The public are not allowed to make experiments for their own interest, and the result is they are very slow to take hold of the matter. And the prejudice which exists for the reasons I have already stated is an obstacle which has to be met and overcome at the outset.

Again, the general impression is that a gas stove cannot be used in a close room. That was true at one time, but now it is not true.

I come now to my first point, which is that private parties cannot supply want. No private party can afford to go into the market and fight down this prejudice and build up a business. I do not believe that the gas stove could ever be introduced if it depended upon private enterprise.

Now, have gas companies any interest in this matter? Consult your own common sense. The public will not buy the stoves, on account of the prejudice I have spoken of. How are we to overcome this prejudice? Why, we must introduce the stove ourselves. I have collected some statistics in regard to this matter, and I think that I shall be able to show you that the

furnishing of these stoves by the gas companies is the very best investment they can make. I submitted these statistics to the board of directors of our company some time ago, and stated my views upon the subject; and they were very much in favor of it. They passed a resolution to introduce gas stoves free of cost. We had one in operation in our office, and we invited our consumers to call and examine it for themselves; and we told them we would charge them nothing for furnishing the stove and putting it up except for the furniture. A circular was sent out to our consumers stating these facts, and a great many ladies and gentlemen came to see the stove in operation. They were delighted with it, and it was on the high tide of success. A great many said they wanted the stove put up right away. I told them we would put them up without cost except that they would have to buy the furniture. They would inquire almost invariably if we did not furnish the furniture with the stove. We told them no; that the furniture would cost some $3 or $4. A good many declined on that account to have them put up who would otherwise have done so. If we had had foreknowledge enough to have gone one step further, and furnished the whole thing, we would have been able to put up a good many more stoves than we did. As it was, however, we put up a great many in our territory, and they gave great satisfaction. That was the blunder we made; but it taught me this, that private parties will not spend the money to buy these gas stoves, and that it is for the interest of the gas companies to furnish them. They ought to send around to their consumers word that they will put up these stoves and furnish everything. I omitted to say that we charged a rent of 12 cents a month, and we told our consumers in every case that if they did not like it we would take them down. In not a single instance did our consumers have the stoves taken down. I think we ought to make this a department of our business. We should furnish these stoves, with everything belonging to them, to our consumers, put them up without cost, and charge them nothing except a merely nominal rent. Let me show you what an investment it is. These stoves cost from $10 to $25. The highest-priced stove, one by which you can cook, and wash clothes, and everything of that kind, costs $25; but the ordinary stove, such as we would want to put up, would cost, I suppose, about $10. The time for cooking has passed, but the season for heating has just begun. Let me bring this matter before you practically. Suppose that we have a gas stove that costs $5. Suppose that the putting up and the tubing cost 90 cents. There is a cost of $5.90, or, say, $6; the interest on that per year, at 6 per cent., is 36 cents. A gas stove will last a long time. For six months you get 75 cents for the stove, or $1.50 a year. There is no way in which money can be invested that will bring in such an interest as that. We will suppose the gas stove to be put up in hall bedrooms, and in bath rooms, where it will not be so very much used; but even if it is not used very much you have an interest on your investment a great deal larger than is afforded by any other industry in this country. If you will figure this up for yourselves you will see that you can make 30 or 40 per cent. on your investment. These figures are upon the supposition that gas is used for heating alone; but suppose it is also used for cooking. The cooking season, it is true, has passed; but where these stoves are put up for heating purposes, at this season of the year, they will prove so satisfactory that their use for cooking purposes will be continued. Suppose that you have four or five hundred stoves that you have put up at this season for heating purposes, it is no trouble, in anything like a large town, to introduce as many as that upon the plan that I have spoken of. When the next spring comes you have three hundred or five hundred consumers using these gas stoves. You have broken the ice; you have aroused public attention; you have excited public interest, and it is more than probable, when the spring comes, those who have been using the stoves for heating rooms in the winter will use them for cooking stoves in the summer. They will be found to be so convenient for this purpose, that their introduction cannot but be extended; and thus, gradually, you will get them among the greater portion of your consumers. The prejudice in the community will be overcome, and the gas stove will be a substantial success.

Much that Mr. Goodwin has said I agree with. So far as my experience goes, burning gas with air previously mixed is a great mistake. In the first place, that is the reason why gas stoves are so injurious to health. They generate so much carbonic oxide. We all know the effect upon human life of carbonic oxide. If you will turn back to the American Gas Light Journal of February 2d, 1877, you will see the result of some experiments that were made in this direction. Three pigeons were put in a bath room where the gas had been burning for an hour. One was put at a height of a man's head, another about half-way between that and the floor, and another on the floor. In ten minutes time the pigeon that was on the wall was down in the corner greatly distressed, and in twenty minutes it was dead. The pigeon that was next below was down on the floor dead in thirty minutes. The pigeon on the floor lived five hours. They took him out at the end of that time, and put him in a cage, and he immediately died. Now, that atmosphere is not the kind of atmosphere that we want in our hall bedrooms and in our bathrooms. I am prepared to prove that mixing air and gas previous to combustion, is not the right thing to do. I can get better results by superheating the gas, and superheating the air, and mixing them, than I can in any other way. I have got the statistics upon this subject, and shall be glad to furnish them to those who desire them. I have made a great variety of experiments in a great variety of forms, and I think I have reached some pretty satisfactory conclusions. One thing I am thoroughly convinced of, and that is, that gas companies can add an immense percentage to their business if they will have energy and enterprise enough to furnish the capital and supply gas stoves to their customers as I have suggested. If they do so they will find that their consumption will be very largely increased, and that it will be a great investment for their money.

Mr. Allen—I would like to ask one question, and that is, if Mr. Hawley tried how long a pigeon would live in coal gas? He has tried how long it would live in carbonic oxide and water gas.

Mr. Littlehales—He says he was burning coal gas under a blue flame which produced carbonic oxide. He didn't say that he used water gas.

Mr. Allen—I think that he is entirely mistaken in relation to it.

Mr. Hawley—You are under the impression that I said the pigeons were put under the influence of water gas. I said it was carbonic oxide. I said that if you will look at the American Gas Light Journal, under date of February 2d, 1877, you will find the facts which I have given. I said that carbonic oxide was generated when coal gas was previously mixed with air before it issued from the burner. The fact is that the air is cold, and it takes just so much of that fuel to heat the air, and it takes a large amount of fuel to overcome it.

Mr. Allen—While we are talking on the gas stove subject I will state that I have one in my kitchen at Poughkeepsie, burning gas made on the Allen-Harris process, that we have been running four years and a-half, going on five years. I have used no chimney with it; but I think that a chimney ought to be used, because I hold that all combustion should be carried to an outlet. No chimney, however, has been used with this stove, and there is not the least perceptible smell from it in the kitchen, and I heartily indorse everything that Mr. Goodwin says in regard to cooking with it. The water gas has a greater calorific intensity, and it will cook quicker than the ordinary coal gas will. A great many have objections to using gas in stoves because there is not a perfect combustion. That is owing a great deal to the burners. If you have poor burners you cannot get a perfect combustion. But, apart from this, I was going to ask the privilege of saying a word or two upon the subject of water gas; but I will not occupy the time now. I would like, however, if an opportunity offers, to say a few words in reference to the difference between the use of water gas and ordinary coal gas for the purposes that are urged here.

Major Dresser—As the facts seem to be what we want to get at, I will state that I was able to get hold of some facts in regard to gas stoves today.

I met a young man on the street and, in the course of conversation, he asked me what we were talking about here. I told him we were talking about gas, and cooking and heating by gas, etc. He said—"The gas stove business is the biggest thing out. Last Spring I bought a gas stove. My wife and myself keep house together on a small scale. We have used the gas stove for three months, and my gas bill was $3.83 for the whole time. If I could'nt get another one all the money in Philadelphia wouldn't buy this one from me."

[To be concluded.]

The Advantages of Using Crushed Coke.

Crystal Palace District Gas Company's Office,
Lower Sydenham, S. E., Dec. 1, 1879.

Mr. Editor: The letter of your correspondent, C. H. Raynor, has been read "across the pond," a good many miles from where he dates. Will you let me tell him through your Journal (for the benefit of others) that what he is doing has been done in Paris for some years. Our engineer, Mr. Charles Gandon, recently obtained from Paris one of these coke breaking (not crushing) machines, which cost in Paris 1000 francs. We drive it with one of Otto's one horse gas engines, and it breaks about 150 bushels per hour.

We find that it takes 16 sacks of large coke, of 36 Imperial heaped bushels, to make 12 sacks of small, and we charge 4s. per chaldron extra for small coke—which pays for the loss and expense of breaking. We have a good market for breeze, for which we get 5s. per chaldron; it is taken away by brick makers in the neighborhood as fast as we produce it.

Our sales of small coke increase as the consumer finds the value of it; and we are now sending out over 80 chaldrons per week to about 1000 of large, or about 8 per cent. of our coke sales. In fact we shall be overworking our small engine, and are having a larger one made for us.

In places where they have not got a good sale for breeze I find they are converting it into fuel under George Anderson's patent—the well-known London gas engineer.

Yours, fraternally,

Magnus Ohren.

THE AMERICAN GASLIGHT JOURNAL AND CHEMICAL REPERTORY

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TUESDAY, DECEMBER 16, 1879.

Official Report of Examinations of Gas for two Weeks ending Dec. 13, 1879, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

Dec. 1879.	Time of Day at which Test were made.	New York Gas Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
1		17.09	17.17	20.18	16.53	16.20	
2	Between	17.05	16.41	21.06	16.93	16.29	
3	9.30 A.M.	17.38	16.77	19.82	16.94	16.08	
4	and	17.22	17.00	18.64	17.01	16.16	
5	1 P. M.	17.28	17.19	18.70	16.93	16 24	
6		17.35	17.10	18.77	17.04	16.35	
	Average	17.23	16.94	19.68	16.89	16.22	
8		17.19	17.13	18.99	17.12	16.53	
9		17 04	16.73	19.03	16.78	16.40	
10		16.97	17.07	19.20	16.50	16.12	
11		16.95	16.91	18.51	16.41	16.09	
12		17.11	17.05	19.36	16.63	16.10	
13		16.91	16.53	18.57	16.72	15.98	
	Average	17.03	16.90	18.94	16.69	16.20	

Sugg-Letheby burner.

E. G. LOVE, Gas Examiner.

Industrial Dwellings and the Death Rate.—It is stated, with reference to the Newcastle Improved Industrial Dwelling Company, that during the eight years their dwellings have been open, the average death rate of the dwellings has not exceeded 12 per 1,000, whilst, during the same period, the average death rate of the town generally had varied from 29 to 22 per 1,000, that of the neighboring district of Pandon being even much higher.—*The Builder.*

Correspondence

[We are not responsible for the opinions expressed by Correspondents. Correspondents, in all cases, should sign their communications with their names and address in full—not for publiction, unless desired, but as a guarantee of good faith.—ED.]

Consolidation in Brooklyn.

Mr. Editor:—This subject being of great public interest, discussion is both timely and beneficial, and I take the liberty of contributing the following to a better understanding of the position of the different parties to such transaction, and the interests involved. The existing companies (the Fulton-Municipal excepted) aggregate a capital stock of over seven millions, distributed in six different companies, and the stock is owned for the most part by the residents of Brooklyn—much of it by estates, widows, and orphans. The Brooklyn Gas Co. was the first organized, since which, from time to time, the others were projected and completed, and each with the avowed intention of supplying cheaper gas—resulting, however, simply in a division of territory, the parent company compromising by releasing to each a certain portion which it had previously occupied, thereby depriving the public of the benefits anticipated from competition. Notwithstanding this repeated virtual violation of implied, if not expressed, contract on the part of the several companies with the people, the Common Council a few years since granted to still another company permission to manufacture and sell gas, and by virtue of such permission the Fulton-Municipal Co. has occupied certain of the streets (mostly thoroughfares), and threatened to prove a formidable rival and competitor for public patronage, but scarcely have they commenced their work when, desiring to become suddenly rich, they purpose to abandon the legitimate business of a fair competition (always expensive for a new company), and, outstripping all their predecessors in ignoring its promises and the just expectation of the people, they propose a consolidation of all the companies, their own included, into one huge, overshadowing monopoly—taking advantage, for that purpose, of a provision in the charter of the Metropolitan Co., which permits it to purchase the stock of or amalgamate with any one or all of such companies, and but for which provision, wrongfully inserted, or through gross negligence on the part of our legislators, no such outrage upon the citizens could be perpetrated. The Legislature should be invoked to right this wrong and prevent its consummation. Such consolidation is evidently not in the interest of the public, whom it both ignors and insults—despoils the people and subverts justice and good government. As between the gas companies, the case stands thus: To effect this consolidation four of the old companies are asked to reduce and surrender of their capital stock respectively as follows:

Citizens' Gas Light Co.	.....	$300,000
Williamsburgh "	.....	250,000
Nassau "	.....	400,000
People's "	.....	700 000
Aggregate loss to stockholders.		$1,650,000

And the balance of their stock to be merged into stock at par of the consolidated monopoly company, which is to have a capital stock of $6,669,000, and a bonded debt of $4,100,000 to start with, being an increase over the present aggregate capital (both stock and bonds) of all the existing companies (the Fulton Municipal Co. excepted) of over $2,000,000; and in this arrangement the Fulton-Municipal Co. is to receive (for absolutely nothing) $1,250,000 stock of the consolidated company. In fine, this enormous sum of $1,250,000 is to be taken from the citizen stockholders in the old companies named, and given, mostly, to the non-residents who organized the Municipal Co. and acquired the privilege to impose both upon the stockholders in the older companies and a too credulous public—provided such consolidation shall be effected, of which there is grave doubt. Instead of awarding credit to the men proposing and those accepting such a proposition, they ought to be contemned. The issue of a fair competition in gas business should be squarely met in the interest of justice to all, and no attempt made to sacrifice beforehand the rights of stockholders or their money in view of probable, or even actual, loss by competition. A healthy competition would secure public benefit, and time and experience doubtless suggest ways and means, both honorable and manly, for the relief of timid stockholders. This month has been fixed as the time in which the stockholders of the respective companies are expected by their votes to ratify such a questionable barter as consolidation of all into one company. Should they accord such ratification, it would not argue much for their courage or sagacity, while it would effectually debar the public the luxury of cheap gas.

D. M. TALMAGE.

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks, (with W B Scott & Co.,)

24 PINE STREET, NEW YORK CITY.

DECEMBER 16, 1879.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid.	Asked.
Gas Co.'s of N. Y. City.				
Central	466,000	50	50	—
Harlem	1,800,000	50	40	45
" Bonds	170,000			103
Manhattan	4,000,000	50	143	147
Metropolitan	2,500,000	100	117	121
" Scrip	$1,000,000	..	100	103
Mutual	5,000,000	100	58	—
" Bonds, gold	900,000	1000	100	105
Municipal	1,500,000	100	140	150
" Bonds	750,000		105	110
New York	4,000,000	100	83	87
Northern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	130	140
Citizens	1,200,000	20	70	75
" S. F. Bonds.	320,000	1000	100	102
Peoples	1,000,000	10	30	35
" Bonds.	325,000	...	--	95
" Scrip	300,000	...	75	80
Metropolitan	1,000,000	100	85	95
Nassau	1,000,000	25	70	75
" Ctfs.	700,000	1000	80	85
Williamsburgh	1,000,000	50	70	75
" Scrip		...	90	95
Kings Co	135,000	100	—	50
" Bonds	40,000	—	—	—
Union Co. E N. Y.		25	—	50
Richmond Co., S. I.	300,000	...	60	85
Out of Town Gas Companies.				
Bath, Maine	70,000	100		
Buffalo Mutual, N.Y	750,000	100	65	70
" Bonds	200,000	1000	95	100
Baltimore, Md	2,000,000	100	95	98
" Ctfs., gold	1,000,000		—	103
Bayonne, N. J		100		90
Brockport, N. Y	25,000	100	...	80
Citizens, Newark	918,000	50	85	90
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			132	—
Cincinnati G. & C. Co.				190
Derby of Conn	160,000	100	60	80
East Boston, Mass		25	114	120
Elizabethtown, N. J.	300,000	20	—	130
Fort Wayne, Ind.		100	...	—
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	120	125
Hempstead, L. I.	25,000	100	...	—
Halifax N. S.	400,000	40	148	150
Hamilton, Ontario	150,000	40	117½	
Jersey City	750,000	20	140	145
Jamaica, L. I.	25,000	100	...	—
Jacksonville, Ill	120,000	50	100	...
Lewistown Maine	400,000	100	70	80
Laclede St Louis Mo.	1,200,000	100	100	105
Long Branch		20	30	40
New Haven, Conn		25	152	—
Peoples, Jersey City		...	40	50
" " Bds.				95
Peoples of Albany	650,000	100	—	10
" Bonds	350,000	1000	--	-
Peoples of Baltimore		25	60	65
" Bonds			106	—
Plainfield, N. J	80,000	100	—	105

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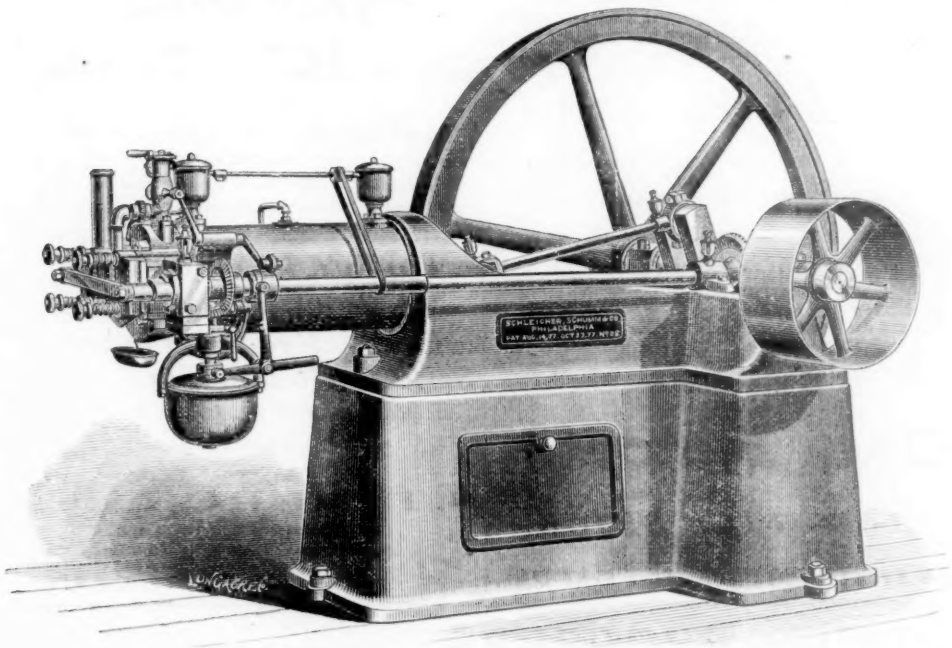

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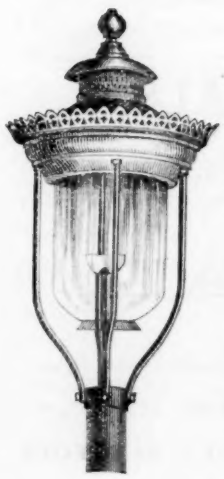

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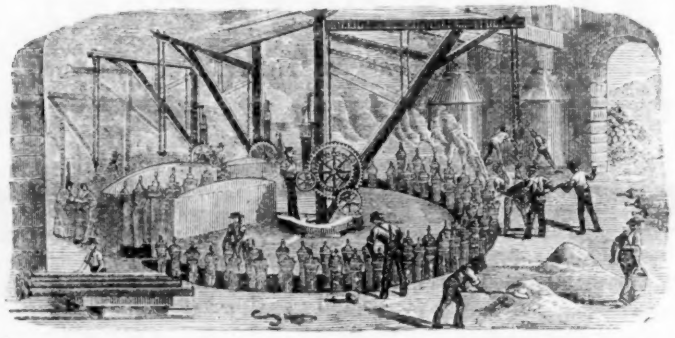

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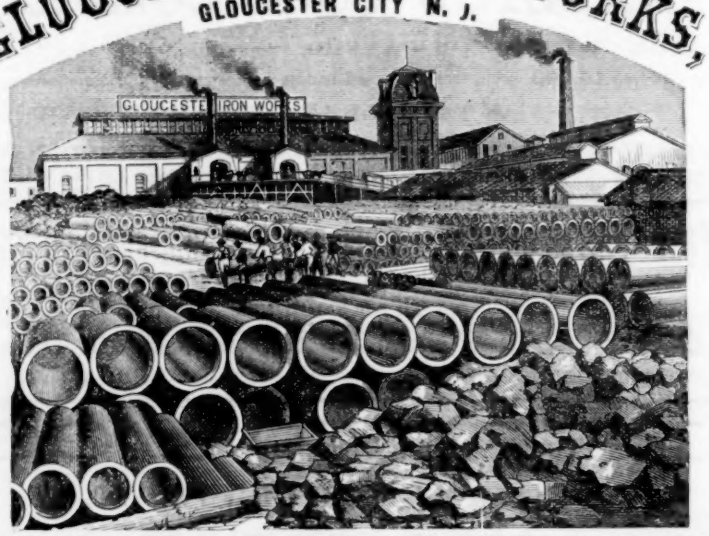

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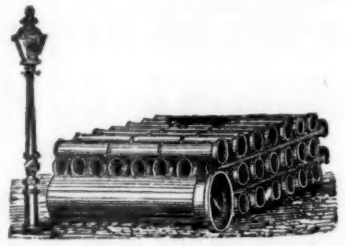

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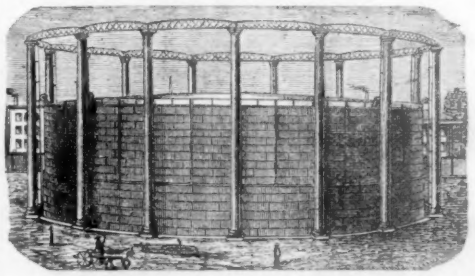

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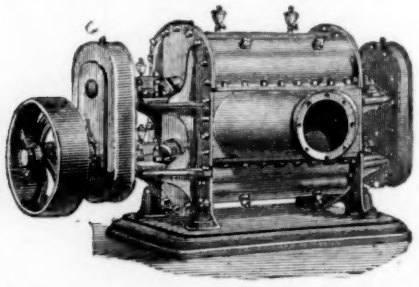

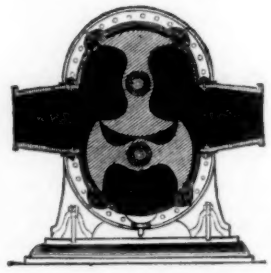

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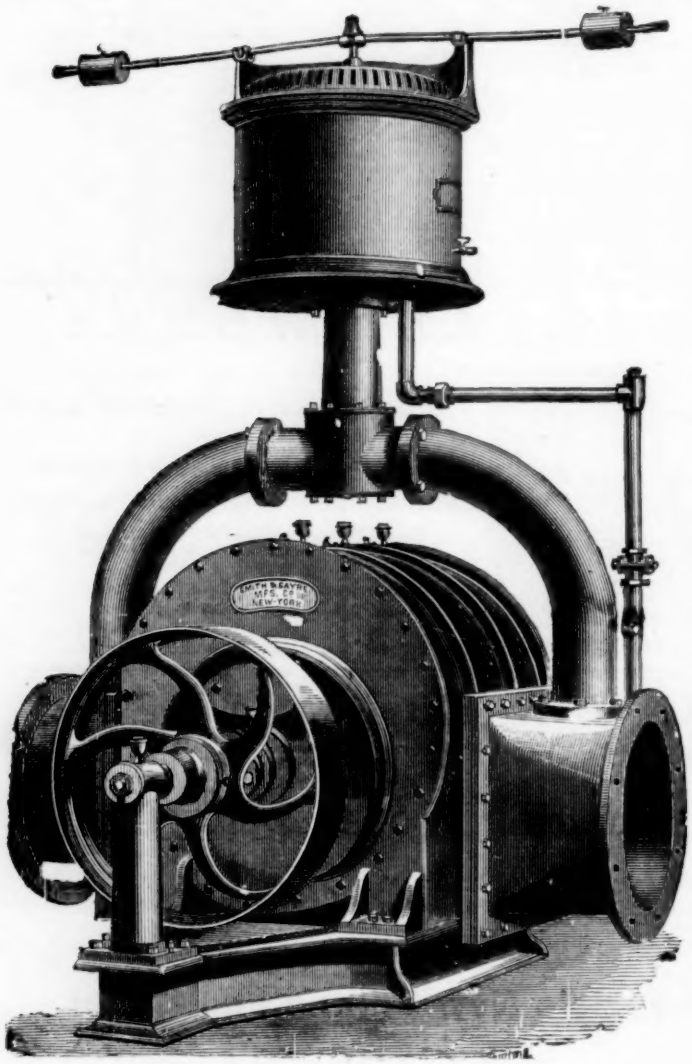

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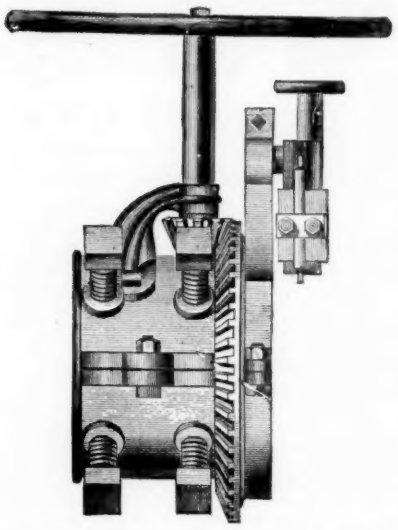

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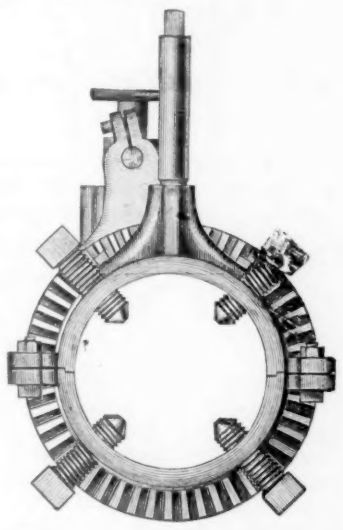

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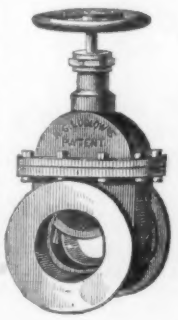

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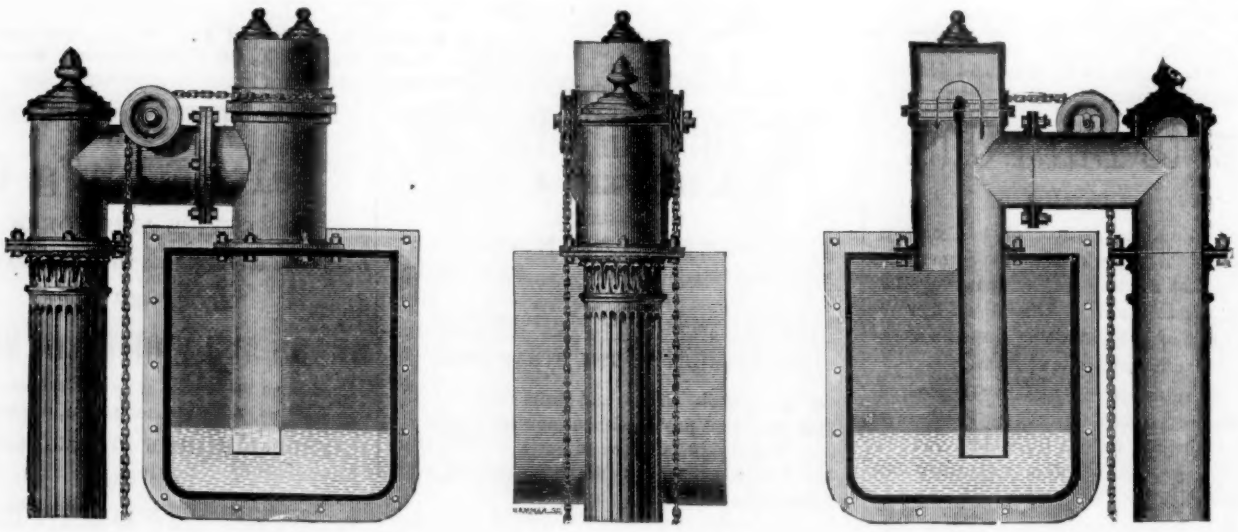

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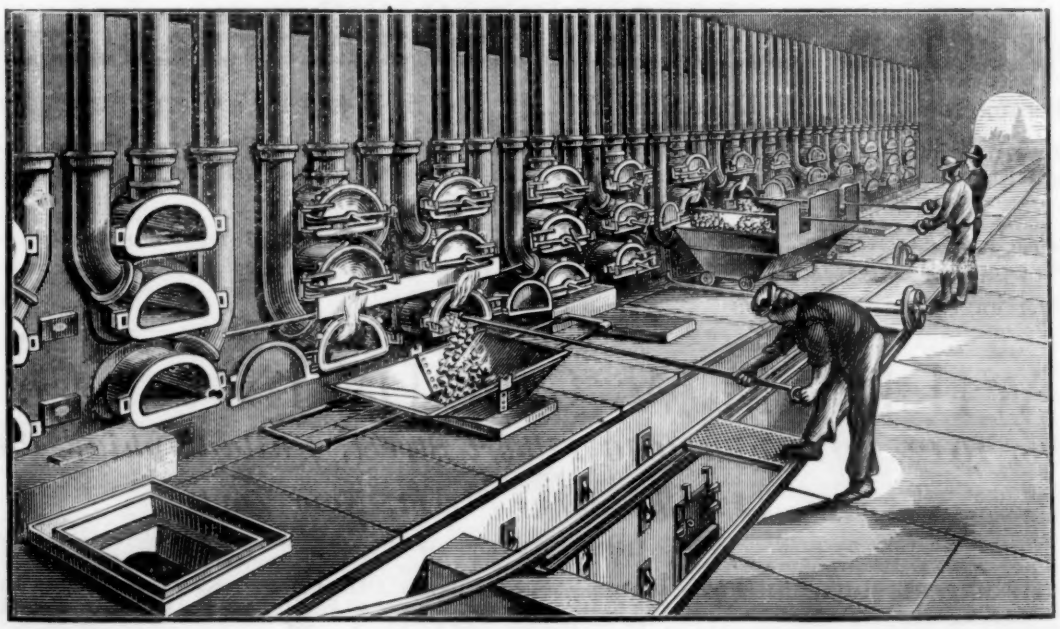

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